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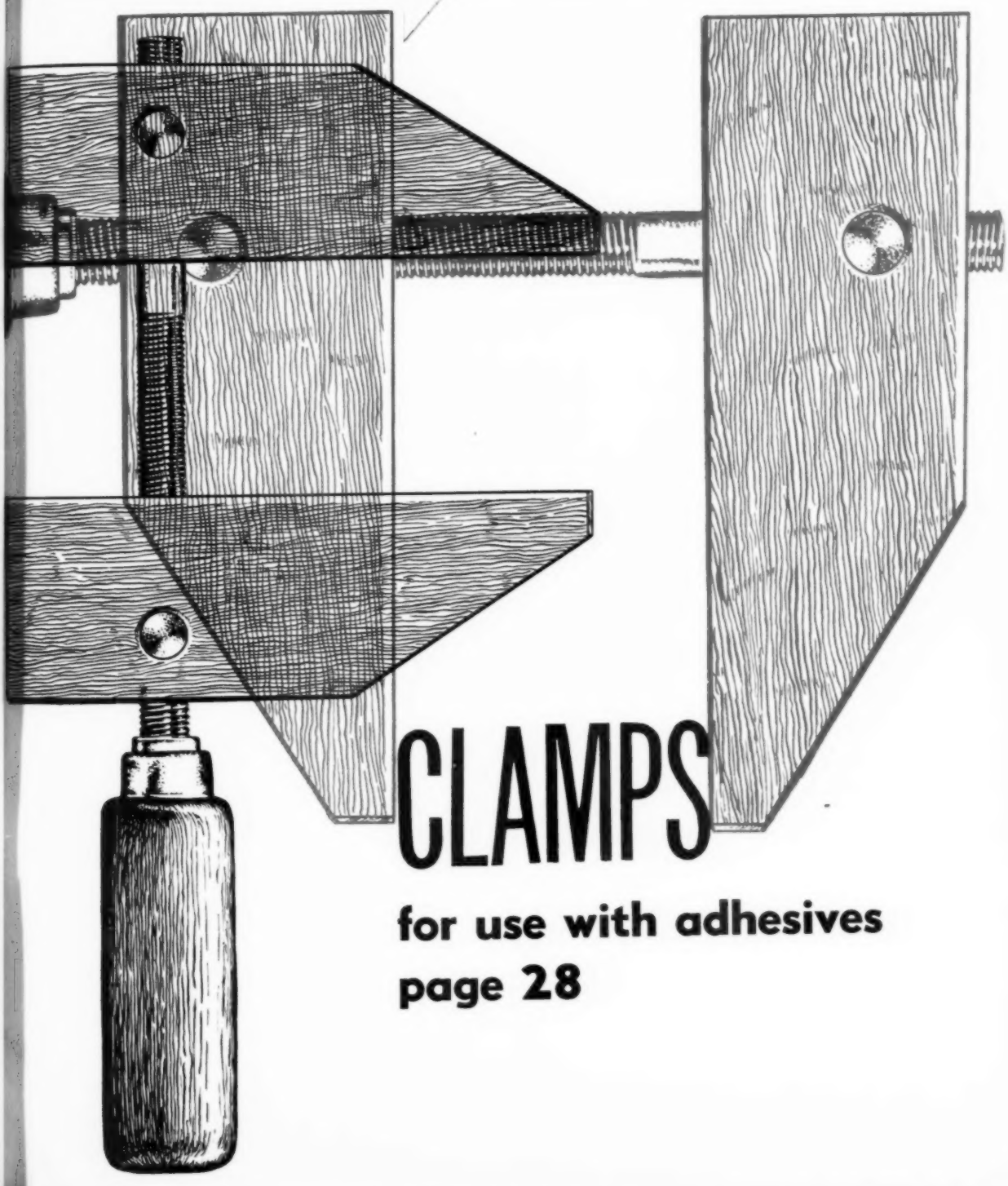
PTEMBER, 1959

ADHESIVES AGE

MANUFACTURE, APPLICATION, TECHNOLOGY, RESEARCH AND MARKETING



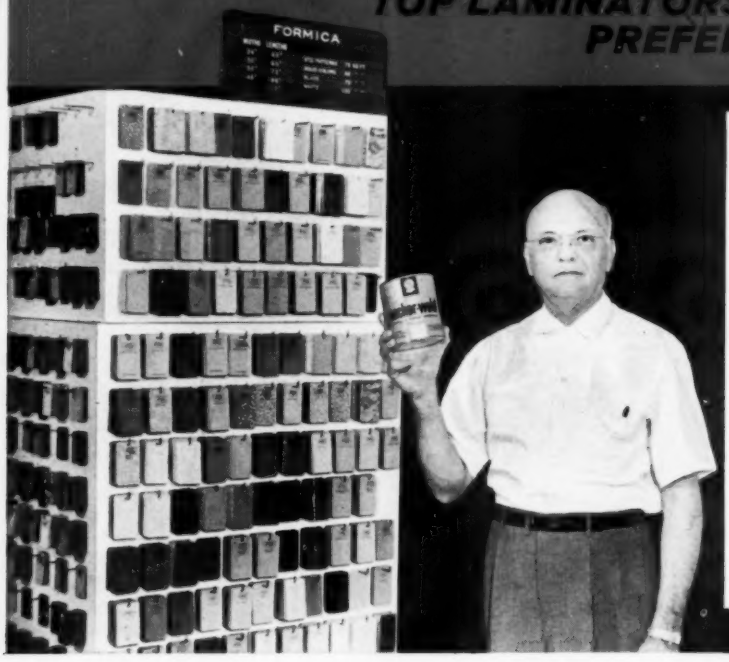
CLAMPS

for use with adhesives

page 28

here's proof that anchor-weld is the best* contact bond cement available!

TOP LAMINATORS PREFER anchor-weld



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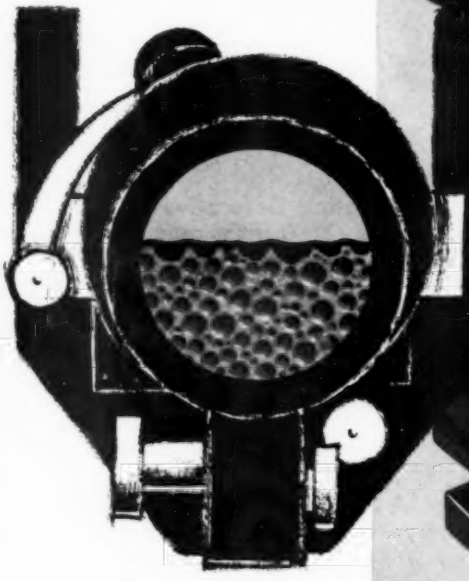

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ADHESIVES AGE

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In This Issue

Bonding Steel to Styrofoam
Step-by-step account of the manufacture of steel-faced foamed polystyrene sandwich panels for Tulane's new dormitory 20

Modifying Animal Glue with Trimethylol Phenol—
By Howard H. Leiner
Low cost glues can be upgraded to compare with higher strength expensive glues by blending with trimethylol phenol 23

A "Perfect" Binding for the *Digest*
A new hot-melt adhesive speeds the production of 13,500,000 copies monthly 25

Mounting Decorative Scrolls
Thermoplastic film technique used in mounting photos is adapted by company producing colorful "kaleidoscrolls." 26

Clamps for Use with Adhesives
The historical origin of clamps and a roundup of the various types currently used in adhesive bonding 28

A 3800-Gallon Tube of Glue
California plywood manufacturer saves on cost of hauling adhesives by using giant rubber-fabric containers 33

About the Cover Design

The relatively simple clamp pictured on our front cover is one of the many different types which are used in adhesive bonding techniques. A complete review of the subject is offered in the comprehensive article beginning on page 28.

The opinions expressed by authors and contributors to ADHESIVES AGE are not necessarily those of the editors or publisher. Articles appearing in ADHESIVES AGE may not be reproduced in whole or in part without the express permission of the publisher.

PP PALMERTON PUBLISHING CO., INC.

SEPTEMBER, 1959

VOL. 2 NO. 9

Hot Spraying of Adhesives
Luggage manufacturer speeds production by adapting this technique for bonding vinyl to magnesium 34

"Peelable" Laminated Metal Shims
Precision gage laminations of stainless steel are bonded with a polyester styrene resin of the paraplex series 36

Adhesive Bonding to Graphite—
By John J. Veliky and Michael J. Bodnar
Organic polymeric adhesives provide high strength bonds to compressed graphite 37

Gummed Tape Problem Uncurled
Bi-flexing paper tape makes it lie flatter and helps water penetration 39

Epoxy Bonding Aluminum Components—
By Neil Kvasnak
Lightweight portable military shelters made by eliminating bolts and rivets 40

Adhesive Eliminates a Costly Welding Operation
Hi-Fi manufacturer slashes production costs by switching to adhesive bonding 42

Adhesive-Spread Honeycomb Core
A brief review of adhesives and mechanical spreaders now speeding production 43

DEPARTMENTS

Book Reviews	64	Names in the News	56
Capitol Clues	13	New Adhesives	10
Classified Advertisements	65	New Equipment	62
Coming Events	52	News of the Industry	44
Consultant's Corner	8	Noted in Passing	66
Editorial	7	On the Continent	17
Patent Review	60		

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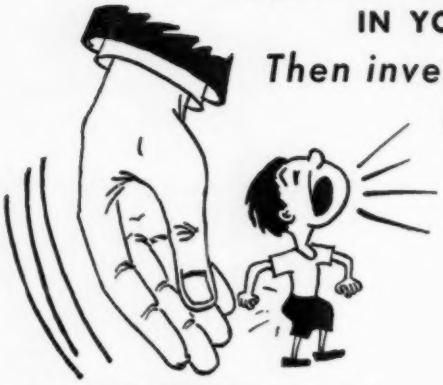

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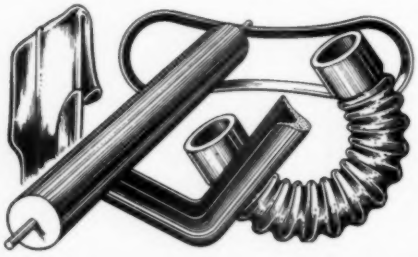

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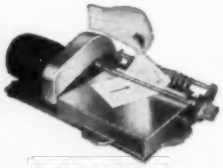

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EDITORIAL

Looking Forward and Back

This issue of ADHESIVES AGE represents a milestone. It is the twelfth consecutive issue since publication of Volume 1, Number 1 in October, 1958. With our first birthday comes the time for reflection and self-analysis.

In order to reaffirm our bearings, we have been re-examining the original precepts on which ADHESIVES AGE was based. Our original thought, prior to publication of the first issue, was to offer a journal covering the manufacture, application, technology, research and marketing of adhesives. It was our intention to bring together the manufacturer, the consumer and the supplier and to make each aware of the other's needs and problems. We meant to bring to each segment of the adhesives industry specific information which would enhance individual operations.

It was our further intention to help in the creation of an "industry" which existed heretofore as several loose components.

In order to meet these editorial aims we have selected with great care the type of articles which have seen print. We have tried to acquaint the consumer of adhesives with techniques and products with which he may not have been familiar. We have tried to relate something of the technology of adhesives—how they are compounded—how they are manufactured.

We have tried to offer some insight into the marketing of adhesives and we have attempted to open new markets. We have tried to tell our readers something about the machinery and the equipment which finds use both in the manufacture and application of adhesives. We have tried to bring books and trade literature of interest to the industry to the attention of our readers. We have attempted to described many, many new adhesives and adhesive products. We have tried to lighten our publication with cartoons and comments designed to amuse. We have tried to present a balanced, readable and informative publication.

We would like to know whether you—our readers—feel that the first twelve issues of ADHESIVES AGE have met the goals we set for ourselves. Is there something which we have not done which we should have done? Is our publication weighted too heavily in one direction or another? You, of course, are best qualified to answer these questions. We value your opinions. With your opinions on hand we shall be able to publish a magazine more suited to your tastes and needs. Won't you write and let us know what you think?

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CONSULTANT'S CORNER

By Dr. Irving Skeist

Question: As I have a rather unusual problem, I would like to have the benefit of your experience and advice. I own a 1957 Ford convertible with a vinyl top, which I am told was originally sewn with cotton thread. This cotton thread has now worn to a point where leaks are occurring at the seam and replacement of the stitching is necessary—the vinyl material is still in very good shape. A new top will cost $90—a sewing job with nylon thread will cost $30, and the local installers of these convertible tops tell me that a re-stitching job would be the most advisable. As information, the car is in the weather all the time, and the top is raised and lowered very often.

It would be greatly appreciated if you will advise if there is an adhesive that can be used in place of the stitching to provide a waterproof, flexible joint in the top. I am sure there is not much separating force at the joint—the main problem being flexibility and waterproofing.

Answer: If we had to start from scratch, we might try a vinyl chloride copolymer resin dissolved in ketones and cyclohexanone, with plasticizer. However, you can probably find suitable vinyl chloride lacquer type adhesives in retail outlets, under LePage and other trade names, recommended for repairing vinyl swimming pools and inflatables.

Coat both surfaces to be bonded, let them dry, then rewet them with adhesive and hold them together overnight between strips of metal or wood under some pressure, provided by "C" clamps, spring clamps, or weights.

Q-117

Question: I would greatly appreciate receiving information on adhesive testing equipment. We are not interested in highly complex equipment but in hand operated testing machines for tack and adhesion. This machine would be used primarily for consumer type adhesives such as paste, mucilage, and rubber cements primarily in adhering paper.

Answer: *Tack*, the ability to take hold quickly, is quite dependent upon viscosity; consequently adhesives should be adjusted to equal *viscosity* before making comparisons. One instrument for measuring viscosity is the Brookfield Viscosimeter (Stoughton, Mass.).

A crude hand test will disclose major differences in tack. Prepare metal stencils, cutting out strips of desired width and length in sheets of desired thickness

CONSULTANT'S CORNER

Readers who would like to contribute their own experience with problems similar to those discussed in Dr. Skeist's column are invited to write to ADHESIVES AGE, *101 West 31st Street, New York 1, New York. Please refer to the code number given at the end of each question and answer group.*

of wet adhesive layer. Place stencil on paper, draw down adhesive with glass rod, raise stencil, and cover adhesive with second layer of the paper, applying slight pressure. After various intervals such as one minute, pull the paper to see whether the adhesive has set, and if so, the extent of fiber tear. Compare time and bond strength with control. Thwing Albert Co. (Philadelphia, Penna.) has a more sophisticated tack tester which is under evaluation by ASTM.

Filming characteristics are important in the selection of adhesives for porous adherends such as paper. Deposit equal amounts of adhesives on paper and rub in circular motion with fingers to see which sits on the surface better.

Q-116

Question: Our company manufactures printed, gummed-paper labels and many of these are shipped to areas where the humidity count is very high.

We have been using a water-soluble dextrine gumming on a machine coated body stock. We print two colors, silver and blue, straight cut and tied in bundles of a thousand with cardboard at top and bottom. We then pack these labels into a corrugated box lined with wax paper and the boxes are packed in a wooden case and shipped by boat to San Juan, Puerto Rico.

Our customer has informed us and shown us that labels which we printed and shipped as above described, arrived at their destination completely stuck together and each pack of a thousand, a solid mass of rock. Can you possibly help us determine what condition may have caused this and can you suggest to us a solution for packing gum paper for shipment to these high humidity areas.

Answer: The packing might be made more moisture resistant by sealing in a polyethylene bag or an aluminum foil laminate. However, your trouble is more likely in the coating itself. You should consider switching from dextrin to dextrin/vinyl acetate resin, using a special dextrin-compatible polymer emulsion such as National Adhesives' Resin 25-1006. Better still, a polyvinyl alcohol/vinyl acetate polymer combination would provide good resistance to high humidity and temperature combined with good rewetting characteristics.

Q-118

Dr. Skeist is associated with Skeist & Schwarz Laboratories, Inc., 89 Lincoln Park, Newark 2, N.J. He is the author of the recently published book, "Epoxy Resins."

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new adhesives

AND ADHESIVE PRODUCTS

Packaging Adhesive

Adhering polyethylene and wax paper can be accomplished with Javatex packaging adhesive. It is recommended by the manufacturer for use on bakery trays and cartons used to package brown-and-serve cakes, cookies, frozen pies and other bakery products. It can also be used for bonding various films to waxed surface packages used in the meat packing industry. The manufacturer reports that Javatex stands up exceptionally well in frozen food carton manufacturing where aqueous or fatty type products are packaged. Excellent results have also been obtained using the adhesive for bonding polyethylene to paper, chip board and kraft board, the manufacturer states. The adhesive can be used to make combination bags of polyethylene and paper, and is available in different viscosities for side seams and bottom seams. The viscosities range from 100 cps to 20,000 cps. It will not bond polyethylene to itself. The adhesive is permanently flexible, shock resistant, and can withstand extremes in temperatures. It can be applied by machine or spray, and has quick grabbing qualities. Javatex is non-inflammable and will also adhere labels to polyethylene containers. The adhesive dries transparent and without any residual odor. *Java Latex & Chemical Corp.* **P-167**

Contact Adhesive Cement

A light cream colored synthetic latex based adhesive classified as a water emulsion type, Paratol 331 contains a low level of aromatic solvent which evaporates rapidly upon application. The adhesive can be coagulated and thereby rendered unusable if frozen solid. Ideal maintenance temperature range is 50°F to 75°F. According to the manufacturer the adhesive has been subjected to and passed rigid testing procedures required to satisfy various industries requiring contact adhesives for rubber and plastic type of floor tile, wall tile, plastic wall coatings, table top surfacing and similar applications. It will brush or trowel on very easily and without resistance. Coverage expectancy is about 160 square feet per gallon and for optimum results, open time on application is recommended between 10 and 30 minutes. *Testworth Laboratories, Inc.* **P-168**

Plastic Putty

Held firmly in place with an all-weather adhesive that withstands up to 500 pounds pull pressure, Sputty, a plastic material, is used to putty windows, around tubs, washbasins, etc. No special skills or tools are required to apply the material since a specially designed bead on the plastic strip slips under glass and provides a perfect bond between glass and molding. Sputty is guaranteed not to chip, crumble or corrode. It can be painted before installation, ensuring a perfect paint job around window panes and other hard to paint areas, and it will not bleed through the paint, the manufacturer states. The plastic comes in 10 foot rolls with a tube of all-weather adhesive. *Jo-El Co.* **P-169**

Plastic Pool Repair Cement

Flex-O-Mend is a soft, plastic all-purpose cement which has found primary use in patching plastic pools. The feature of this adhesive is that it can be used in making the pool patch under water. The adhesive is packaged with the patching material. It can also be used for bonding other materials as well as plastic. *Boxer Distributors.* **P-170**

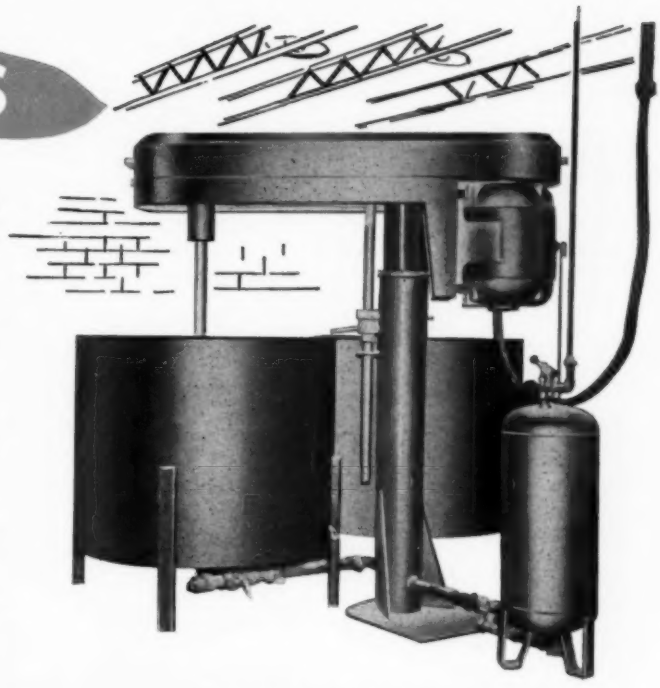
Silicone Rubber Cement

A two part adhesive designed to provide a seal patch system for silicone rubber coated diaphragm seals is called C-319 RTV. It also provides a convenient system for bonding silicone rubber to silicone rubber and silicone rubber to metal, the latter with the aid of a metal primer, called C-320. Part one of the adhesive is an extreme low temperature flexible, silicone rubber solution containing about 35 to 40 per cent solids. Part two is a non-volatile room temperature vulcanizing catalyst in solvent. The rubber-to-rubber and rubber-to-metal bonds attained with the adhesive are reported to have excellent low temperature resistance. The brittle point is well below —100°F. The high temperature limit is about 350°F. with well cured silicone rubber. The manufacturer reports that samples have been aged for 96 hours at 350°F. with little loss in bond strength. Used with lightly cured silicone rubber, however, the high temperature limit for the adhesive is 300°F. In rubber-to-rubber applications the material achieves its maximum adherence on well cured rubber, and the manufacturer recommends that for silicone rubbers with little or no post curing, surfaces should be pretreated with a catalyst. *Connecticut Hard Rubber Co.* **P-171**

Phenolic Sheet to Metal Bond

Bostik 7026 is an adhesive which obtains exceptionally high tensile strength in bonding to metals or glass and is reported to be effective with ceramics and cured phenolic, urea and melamine molded plastics. The manufacturer states that the adhesive was designed for primary usage in bonding phenolic sheet to metal in the manufacture of switch and contact assemblies. It can also be used in the manufacture of speaker coils as a paper and wire coating. Additional uses are as a prebaked primer on metal brush ferrules to promote adhesion for bristle-setting compounds and also as a general purpose, wet-stick cement for electrical assemblies without the use of heat. According to the manufacturer, when the adhesive is heat cured, shear strengths of 4950 psi have been recorded. Bostik 7026 is a clear, amber solvent solution of synthetic resins and is reported to have excellent aging properties, and resistance to water, gasoline, and heat up to 250°F. *B. B. Chemical Co.* **P-172**

COWLES DISSOLVER processes 200,000 gals. per mo. of rug backing compound for Consolidated Latex Co.



Cowles Model 720 VH with dual tank setup provides practically continuous processing for Consolidated.

"... eliminated need for bulky, old-fashioned milling and mixing equipment — handles complete processing operation in one pass, in much less space, at less cost," reports William Stellings, President.

William Stellings, President, Consolidated Latex Co., Chattanooga, Tennessee.

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Multiwall Bag Sealer

MVT sealer is used in in-plant application of moisture-vapor end seal to multiwall bags. On bags having barrier sheets, it provides shipping containers for chemicals that must be protected from moisture. The polyethylene tape closure becomes molten during application, and flows around and into bag stitching perforations, locking thread into position and preventing the threads from cutting into the paper bag. It also fills and seals any holes that result if sewer skips a stitch. The sealer uses both heat and pressure to apply tapes in a wide range of materials, ranging from 1½ to 5 mil polyethylene. It fits into the filling line after sewing head, and operates uninterruptedly at regular line speeds of 32 to 48 fpm. It also picks up automatically at the same height as the sewer, thus eliminating any variance between stitching and tape. The tape is carried with the bag between opposing flexible heated belts running between and around two sets of pressure rollers. It wraps around the sewing materials, draws the seal down against the bag end, and seals tightly to both leading and trailing edge of the bag. *Hudson Pulp & Paper Corp.* P-173

Pipe Joint Seal Tape

Designed to seal threaded pipe joints, plastic Tape-Seal can be applied quickly and eliminates dripping and splattering. It is unaffected by extreme temperatures and is completely inert. The manufacturer reports that one of the features of the sealing tape is that it will not harden after application so that disassembly of the pipe joint is easy. The tape is available in ½, ¾ and 1 inch widths, and in self-dispenser rolls of 70, 250, 500 and 1000 inch sizes. *Friesland Plastics Co.* P-174

Epoxy Laminating Resin

Epocast 28 is an epoxy laminating resin suitable for glass cloth, structural laminations and for electrical insulating purposes. Among its feature are the ability to meet military requirements; very long pot life (approximately 3 days at 75°-80°F.) and good impregnating qualities; relatively short cure at moderate temperatures (2-3 hours at 250°F. or 1 hour at 300°F.); good electrical properties; and a low dielectric constant. The epoxy, in conjunction with Hardener 9012, forms an excellent structural resin, particularly suited to the laminating of glass fibers. It is a good casting resin, suited to potting and encapsulating of electrical components. *Furane Plastics.* P-175

Epoxy Dipping Compound

An epoxy compound which has been developed for encapsulating, by dipping small electrical components such as ceramic wafer capacitors, resistors and small transformers, Hysol 10-80 is a black thixotropic material which produces an even non-dripping coat on pieces up to

one inch cube. The mixture is quite viscous. However, when some relative motion is produced between the system and the part being dipped, the viscosity at the part reduces sharply so that the compound can flow evenly over the part. On withdrawal, the viscosity rises so that no dripping occurs, even at cure temperatures as high as 160°C. The manufacturer states that the dipping compound has passed the temperature and immersion cycling tests set down by Mil-CO11015A Capacitors Fixed Ceramic Dielectric. A 10 day moisture resistance test was passed averaging 100,000 megohms against the specified minimum of 100 megohms. *Houghton Laboratories Inc.* P-176

Vinyl Protective Coatings

Magna-Bond vinyl type protective coatings can be permanently bonded to metal, wood, concrete, etc. According to the manufacturer the coatings are abrasion and impact resistant, non toxic, and electrically nonconductive. They are also resistant to alcohol, gasoline, oils, most chemicals; sewage, grease, etc. Nonflammable when cured, the coatings are also odorless. *Magna-Bond, Inc.* P-177

Releasing Parchment

Releasing Parchment No. 40-91T is for industrial applications where color and smoothness of the vegetable parchment are not critical factors. Uses recommended by the manufacturer include an all-purpose release backing for any type of tacky material; interleaver for rolls and slabs of raw rubber; release backing for pressure sensitive felts, tapes and gaskets; separator strips for rubber tapes; casting sheet for organic adhesives, films and organasols; and casting sheet for chemical foams. Possessing moderate weight and rigidity, excellent release, high strength, and resistance to wetting and staining, the parchment also has smooth fiber free surface; fair flexibility; and good water shedding and resistance to oil and plasticizer penetration. *Paterson Parchment Paper Co.* P-178

Epoxy Resin Kit

The kit contains a preportioned cartridge of epoxy resin and hardener. It was formulated for various sealing jobs and the resin containing unit has a barrier between the two parts of the epoxy system. The unit is crushed by hand before inserting the cartridge into an applicator gun, and no refrigeration of the unbroken resin cartridge is needed. The kit contains 175 grams of epoxy resin. *Electronic Production & Development, Inc.* P-179

Contact Bonding Adhesive

A water base non-flammable contact bonding adhesive, Wilhold Safety Contax Cement dries fast with high strength, and is used in mounting panels of plastic laminate, wallboard or plywood to walls, sinks or table tops, without nails, weights or clamps. The adhesive can be brushed, sprayed or rolled on and dries quickly. It is waterproof when dry, yet washes off hands and equipment easily with soapy water. *Wilhold Products Co.* P-180

FOR MORE INFORMATION on the new adhesives described in these columns, use the Reader's Service Card elsewhere in this issue.

capitol cues

THE STEEL STRIKE HASN'T HURT PROSPECTS FOR THE FALL—that's the view of top government economists. They think business will bounce back rapidly in the wake of the settlement and after other affected lines get back to normal. The large inventories of steel held by users have limited the strike's impact. So, on balance, the third quarter won't look too bad. There won't be a slump. It's just that the economy's gains will be smaller than those of last Spring.

The economy has plenty of underlying strength. Auto sales will continue high, helped by the new small cars. Road-building will be another plus. Business will still be trying to build inventories, and outlays for new plants will keep expanding.

Here's how some leading indicators will look by the year-end:
- Factory output will rise 3% or so, for a 1959 gain of 11-12%.
- Employment, already at a record, will go up another million.
- Unemployment will fall below 3 million, the lowest since '57.
- Prices will keep climbing, despite seasonal declines in food.
- Gross National Product—total output of goods and services—could hit an annual rate of $500 billion by the close of '59.

THE FAST FINISH TO 1959 WILL SPILL OVER TO '60, turning into a boom. Businessmen will find men, money, and materials, in ever-tightening supply. Consumer buying—mainly for hard goods like autos—will give the economy a substantial lift. Business' own spending for new plant and equipment will furnish even more push. Most economic indicators will be setting records.

INTEREST RATES ARE LEVELING OFF SOME, but they'll resume the rise in the Fall. That's the view of Washington experts who follow money trends. One reason for the slowing will be the fact that industry will be living off big inventories built up before the steel strike. They will pay off loans. And the Treasury won't be borrowing or competing with business till October.

Once the rise starts again, the experts foresee an increase of another ½% or so—no more. Corporations have plenty of cash from their big profits and savings. And resistance of borrowers usually sets in when rates rise. But with credit already tight, it won't take much to add to the pinch which business already feels. Loans will be smaller, hard to get.

CORPORATE PROFITS HAVE REALLY BEEN ZOOMING, justifying even the most optimistic forecasts made earlier this year. In the second quarter alone—April-June—corporations earned 75% more than in the depressed second period of 1958. Biggest year to year gains came in autos (up 300%), steel (165%), rubber (110%), glass (100%), nonferrous metals (95%), machinery (85%), plane making and chemicals (75% each), building materials and paper (40% each), retailing (35%), and metal products and electrical equipment (30% each).

New profits records are being set this year, even though the business rise is slowing this quarter. First-half profits topped 1958 by 50%; the second-half gain will be only 25-30%. This would mean $51-$52 billion for all 1959—40% over 1958.

capitol cues (con't)

DIVIDENDS WILL BE RISING SUBSTANTIALLY, but not by as much as profits. Company managements are moving cautiously, to judge from the current trends. They're putting much of their profits into new plant to keep pace with sales. But this still will leave plenty for year-end extras. Payments will top 1958 by 15% to 20%. The cyclical industries that move up and down along with the business cycle—steel, autos, rubber, and railroads—will lead the parade.

MORE NEW RECORDS IN THE STOCK MARKET are being forecast by analysts. They see further rise in share prices as a result of the large increases in profits and the prospect of big hikes in dividend payments. In addition, business is sure to rebound in the wake of the steel strike. What's more, history favors a rise; upturns have occurred in 37 of the last 41 Summers. The Dow-Jones Industrials Index may hit 700 this Fall, if history is a guide.

SMALL BUSINESS INVESTMENT COMPANIES ARE DISAPPOINTING some potential borrowers. The new banks, authorized last year by Congress, are beginning to operate in numbers. Interest rates charged on loans average 10% to 12%, with 15% asked in some cases. Other "strings" may include representation on the borrower's board, plus vetoes over dividend policies and any future long-term financing. The first banks doing business find it necessary to attach such strings to loans because the firms financed are usually risky.

REGULATION OF STATE TAXING OF INTERSTATE FIRMS may be voted this year or next by Congress. Fifteen Senators are pushing a resolution to establish a commission to recommend uniform standards for such taxes—a big headache for business. The taxes are hard to comply with and more are coming all the time.

> The states would be asked to tax, for now, only firms with inventories or an office in the state. (Congress may move in under the Constitution's interstate commerce clause.)

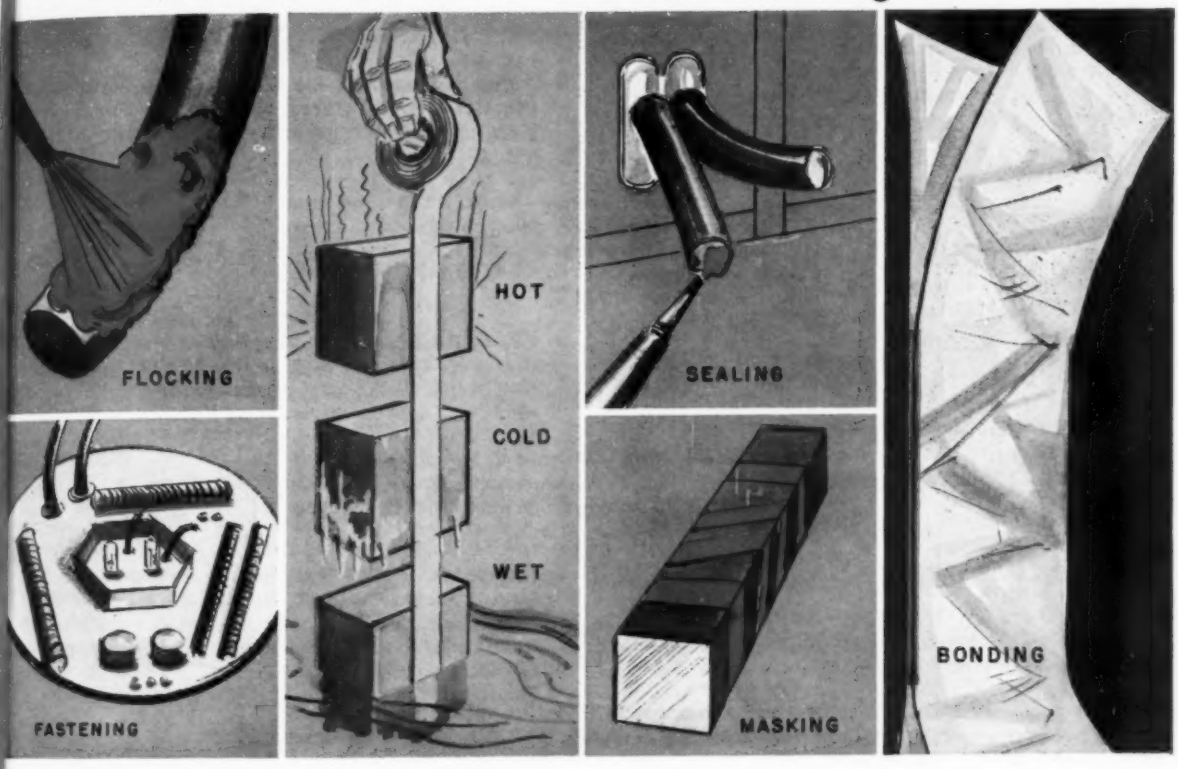
MORE SPACE CONTRACTS FOR SMALL COMPANIES WILL RESULT from a program being launched by the National Aeronautics and Space Agency. It calls for (1) setting up a list of firms interested in such business, (2) screening contracts NASA lets to see which small firms could handle, (3) staging of conferences at which contract terms will be explained, and (4) encouraging pools of small companies to bid jointly. Small firms can do well in space work; many items must be custom-made and are suited for small-scale output.

THE NEXT LABOR CRISIS WILL COME THIS FALL in the railroad industry. The issue that will bring a deadlock is "featherbedding." Rail executives say they'll take a strike if the unions do not give in; they say make-work under outmoded rules costs $500 million yearly and blocks rate cuts needed to meet competition from trucks and barges. Railroad unions are ready to make only small concessions. Leaders will cite improving profits and high productivity to show the rules do not hinder operations. It's hard to see a long tie-up, but it's also hard to see a basis for a peaceful settlement.

THE FIRST UP-TO-DATE BUSINESS DATA IN A DECADE will soon be published by the Census Bureau. It will be carried in the first report on the Census of Business, Manufacturing, and Mineral Industries, made in 1958. It will show primary product data for 700 major industries. Later reports will hit production, markets, costs, and capital spending. Meantime, the government is preparing for its regular 10-year Population and Housing Census in 1960.

SILICONE NEWS from Dow Corning

Wet, Cold, or Hot, They Stick!



Pressure-Sensitive Silicone Adhesives Offer Unusual Properties

Dow Corning *silicone* adhesives have a special set of properties not common to any other materials. These pressure-sensitive silicones form a good bond with practically anything . . . even wet surfaces, polyethylene, or untreated Teflon. They can be applied, and will stay applied, at temperatures from —80 to 500 F. They are highly resistant to moisture, oxidation, corrosive chemicals, weathering, arcing, corona and fungus. They also have excellent dielectric properties.

Put 'Em on Tape. Dow Corning silicone adhesives form superior pressure sensitive tapes with backing materials almost unlimited. Many tapes utilizing these adhesives are already commercially available; they include backings such as glass cloth, Teflon, Mylar, aluminum foil, Silastic®, the Dow Corning silicone rubber, and combinations of these materials. Supplied by several manufacturers, tapes made with Dow Corning silicone adhesives find a variety of end uses, depending on the backing material. Some of these are: electrical insulation in aircraft, ships, power plants, generators and appliances; bonding, splicing, and sealing; masking in chemical milling; release surfacing; electroplating.

They Stand Alone, Too. As independent adhesives with no backing tape, silicone resins perform a multitude of functions . . . many more are yet to be discovered. A few examples of current applications: fastening electronic components together; coating ductwork in aircraft, in combination with asbestos fibers for thermal insulation; sealing the ends of heating elements in appliances; bonding aluminum foil to itself for use in cryogenic systems; bonding mica and asbestos panelboard; bonding Silastic to the coils of electrical equipment; assembling small aircraft parts or components.

Versatile. As tapes, sealants, spray-on coatings, bonding materials, splicing agents, or in other applications, Dow Corning silicone adhesives show good bond and peel strength, and exceptional resistance to deterioration. If you manufacture adhesives, tapes, sealants, or any product making use of these materials, you should investigate Dow Corning silicone adhesives.

Write today for technical data or assistance. Address Dept. 0121.

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

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TECHNOLOGY OF ADHESIVES AT YOUR FINGERTIPS

A A SERVICE

Subscribers to ADHESIVES AGE may now obtain, from one central source, technical literature dealing with all aspects of the adhesives industry. One or more of the books listed here may be of invaluable assistance to you. Look this list over and check the books suited to your needs.

- **Adhesive Bonding of Metals—G. Epstein. $2.95.** Considers adhesives used with metals, indicating when an adhesive-bonded joint is advantageous; the type adhesive to use; how to use it, and how to design the joint for optimum performance. ☐

- **Adhesive Bonding for Fibrous Glass Reinforced Plastics—H. A. Perry. $8.75.** A theoretical and practical manual on the joining of glass reinforced plastics. ☐

- **Adhesion and Adhesives—N. A. De Bruyne and R. Houwink. $13.50.** A collection of information on the scientific and technological aspects of adhesion. Part I deals with theory, while Part II is devoted to the technology of adhesion. ☐

- **Epoxy Resins—Their Applications and Technology—H. Lee and K. Neville. $8.00.** Guide to the field of epoxy resins, covering the chemistry of their preparation and applications, including a section on adhesives. ☐

- **Polyamide Resins—Donald E. Floyd. $4.50.** Discusses in detail various important applications of the polymers belonging to the polyamide resin family and includes a comprehensive section on adhesives. ☐

- **Principles of High Polymer Theory and Practice—A. X. Schmidt and C. A. Marlies. $13.50.** Study of the principles of high-polymer theory and practice, with a section on adhesives, their applications, and mechanisms and factors involved. ☐

- **Recent Advances in Gelatine and Glue Research—G. Stainsby (Editor). $12.00.** Study of Collagen, and its protein gelatine, comprising papers and Proceedings of an International Conference of the British Gelatine and Glue Research Association. ☐

- **Rubber-to-Metal Bonding—S. Buchan. $4.00.** Discusses methods for bonding natural and synthetic rubbers to metals of all kinds, for use by those who manufacture rubber-metal units, and of interest to the rubber-minded engineer. ☐

- **Vinyl Resins—Mayo Smith. $5.75.** Surveys applications of vinyl resins with information on their types, properties, chemistry, manufacture and fabrication. Includes information on several types of adhesives in this category. ☐

- **Adhesion and Adhesives: Fundamentals and Practice—F. Clark, J. E. Rutzler, Jr. and R. L. Savage (Editors). $10.50.** Papers read at a Symposium at Case Institute of Technology and a Conference in London, on the status of knowledge in adhesion. ☐

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• Several months ago we reported about a steel bridge which does not have rivets but was fastened together exclusively by adhesives. In the ensuing months we tried to obtain additional details and to find the location of this particular bridge. During our trip through Germany we discovered the bridge. It is used to cross an auxiliary channel of the Lippe River near Marl-Huels. The entire bridge, about 504 feet long has been glued together using several hundred pounds of a special polyester adhesive.

• "Stuck Up Wallflower" is the heading of an illustration which the American army paper *Stars & Stripes*, printed in Darmstadt, published a few weeks ago. The photo shows a very charming lady sitting in a chair which is glued to a wall approximately two or three feet above the ground. The caption says, "A model demonstrates the adhesive strength of a new glue which has been used to seal her chair to a brick wall at Detroit, Mich. The glue, called Liquid Iron, will bond iron, wood, porcelain, glass and many other materials, its makers claim."

This kind of publicity should be used more often by many manufacturers in our field. So far, only one American company has utilized the power of public relations in a very effective way. Eastman Chemical Products demonstrated, last Fall in New York, their new adhesive called Eastman 910. Almost seven months later we found in many Swiss and German papers short paragraphs reporting the new adhesive with all the details, thus creating a great amount of interest. Similar efforts of other American manufacturers would generate a considerable amount of inquiries.

• The Soviet minister for light industries, Mr. Mirowrzew, has informed the public that henceforth Soviet tailors will glue the seams of garments and suits using a particular adhesive instead of sewing. This information appeared in the German daily newspaper *Soester Kreisblatt*, on July 2, 1959.

• American companies interested in expanding their business contacts with Western Germany will find the American Chamber of Commerce, Rossmarkt 12, Frankfurt/Main, Germany, a very important source of information. The manager, Paul G. Baudler, whom we met a few weeks ago, showed us the very nice and spacious offices of the oldest American institution of this kind on the Continent. Many leading American firms have been members of this Chamber of Commerce for many years. In view of the many favorable business opportunities in Germany and in the European common market, it would be advisable for many American firms to investigate the European potential.

• Business conditions in Western Germany and in the European market are watched continuously by Edmund Francis Becker, the commercial attache of the U. S. Embassy, Amerikanische Botschaft in Bad Godesberg, Germany. During our European trip we had the privilege of discussing many questions relating to the development of industry and commerce with the commercial attache. Mr. Becker emphasized the ever increasing interest of German industrialists in American developments and he deplored the fact that this interest is not matched by American industry and trade. There is a wealth of information assembled and kept handy in the offices of Mr. Becker and every American firm that is interested in any facet of the great possibilities which present themselves right now in Western Germany, and for that matter, in the European common market, will receive answers to many questions and solutions regarding their problems.

Mr. Becker's office maintains an important library consisting mainly of many American technical magazines and related publications, and in addition, quite a number of books. Many people visit the library and Mr. Becker emphasized the importance of this source material which has been, in many instances, the reason for very profitable business connections between America and Western Germany. After having chatted with Mr. Becker for a number of hours, we expressed our satisfaction in seeing how well the money of the American taxpayer is used in this particular instance.

• During our recent European trip we visited almost all of the important German cities and several other countries. We were surprised to see how many American companies are already doing business with Germany and Western Europe. American products are to be seen everywhere; when crossing the streets one encounters the trucks of the Cocoa Cola Company, as well as other American soft drinks and orange juice from Florida. Many American products can be seen in the windows of the shops and the local newspapers carry many advertisements corroborating the ever increasing contacts between America and Europe.

Looking over just one issue of one leading German newspaper, one finds a large ad from IBM, looking for people to join their marketing staff and other departments in its vast offices in Sindelfingen near Stuttgart. John Diebold & Associates, Inc., management consultants in automatic data processing and automation, New York, advertises in English looking for engineers and economists. International Harvester Co. is looking for an office manager for their German office in Neuss/

On the Continent

Rhein. Minnesota Mining & Manufacturing Co. is looking for a number of salesmen who will work out of its office in Dusseldorf. In its ad 3M points out that it has factories in Argentina, Brazil, two factories in Germany, three in England, four in France, other establishments in Canada and Mexico, and 11 factories in the United States. The ad concludes with the statement that the sales organization covers the entire Western world. Vickers, Inc., Detroit, Mich., a division of the Sperry-Rand Corp. is looking for a number of engineers and chief inspectors for its German subsidiary in Bad Homburg which was established in 1956. The advertisement printed entirely in English partly states:

"Vickers, a leader in the field of oil hydraulics, maintains factories and distributing branches in most of the industrial centers of the world. Our plans call for continued expansion to satisfy the needs of Germany and the rest of Europe. This means exceptional opportunity for the individaul to grow with us."

Every issue of the leading Swiss newspaper *Neue Zuericher Zeitung* carries many advertisements, many in English, which have been inserted by American companies. To name just a few, we find the Lederle Division of Cyanamid International Corp., the Wander Co., manufacturer of Ovaltine in Villa Park, Ill; Du Pont de Nemours International in Geneva; International Malleable Tube Fitting Association in Schaffhausen; Nestle in Vevey; General Electric and Ford Motor Co., both in Zurich; and the Paper Mate Division of Gillette in Neuchatel.

These ads reflect only a small part of the ever increasing cooperation between America and Europe. Every day additional American companies establish footholds on the continent and we have been informed and also have seen that this movement will continue for some time to come.

• The polyvinylchloride installation which has been installed in Oswiecim (Auschwitz), Poland, was closed in August, 1959, because it is alleged a number of units of the factory which had been designed and supplied by the USSR have proven defective. Spare parts were not available and it is for this reason that the factory has been closed down.

• The polystyrene factory in Oswiecim (Auschwitz), Poland, went on stream at the beginning of this year. During the month of January and February, about 142 tons were manufactured. The annual production this year will reach about 700 tons.

• Czechoslovakia will increase her exports in order to obtain enough funds to import plastics of all kinds. The domestic production does not cover the requirements and it is for this reason that larger amounts of plastics have to be imported. At the present time, about 40,000 tons of plastics are manufactured in Czechoslovakia; it is planned to increase this figure to 160,000 tons by 1960

• Many hardware, house furnishings, five and dime, and other related stores were visited by us during our European trip. We looked around in order to discover what kind of adhesives are sold in these stores. We hardly found any one of the American brands and discovered that there is considerable room for improvement. Many American brands are unknown and many American glues and cements are not available in Germany and other Western European countries.

Special preparations such as "porcelain-enamel" are not on the shelves but very soon will be in a very increasing demand. Iceboxes and refrigerators have been manufactured during the last two years on an ever increasing scale and it is for this reason that a demand for repairing the chipped appliances will manifest itself before long. The same holds true for a number of other enameled electrical and non-electrical appliances.

It seems to us that every manufacturer interested in expanding his contacts and trade with Europe should investigate the possiblities of the markets; a trip to Europe is inexpensive, it takes but 6 to 10 hours to fly one way and generally speaking, everybody knows a little bit of English. It goes without saying that the personnel in the better hotels and restaurants are able to converse in English quite fluently.

• The government of Red China has ordered the introduction of the metric system. The law promulgated on June 25 concerns all measurements of length and weight. In certain cases, British measurements are still used because in recent years, Red China has imported quite a bit of machinery from the United Kingdom which, of course, is based on British measurements and standards. Some measurements of lengths, primarily the nautical mile, will still be used.

More and more countries turn to the decimal system and use metric measurements. Who would have thought 40 years ago that China with her complicated alphabet would ever be able to adopt the simple decimal system? If China, India and many other states can do it, when will the United States muster the will power and adopt the metric system also?

We believe that more scientists should start writing to their representatives and raise this very important issue. How about starting in a small way? For instance, when ordering thermometers, they should specify not only Fahrenheit, but also Centigrade calibrations, thus reminding factories that the decimal measurements are used all over the world.

• The European Common Market has opened the door for French car manufacturers to export to Germany on a larger scale, in spite of the fact that the Volkswagen dominates the German roads. The German Citroen Sales Agency has bought 22 acres of ground at Westhoven, a suburb of Cologne, in order to construct a warehouse for spare parts, a repair shop and management offices. The agency visualizes a sales figure of 3000 units a year at the beginning and hopes to increase this figure considerably.

NOW! FABRICATE COMPLEX CASTINGS WITH 3M ADHESIVES!

Here's a new, virtually fool-proof way to fabricate complicated hollow castings. Simply bond and unitize individual *die*-cast *sections* with high-strength 3M structural adhesives, such as EC-1386. You'll cut rejects and costs, boost production, too.

Die-casting of sections eliminates rejections due to blow holes in sand core castings . . . means smoother, more detailed parts because of the machined surface of the metal die. And by bonding with 3M Adhesives rather than mechanically fastening sections, there's no need for costly machining and equipment, no wasteful bosses or flanges to eat up space. Easily applied with a flow gun, EC-1386 is 100% nonvolatile, and requires no pre-drying before joining sections.

With EC-1386, indexing or pressure jigs are not needed. The adhesive cures to high ultimate strength quickly in an air-circulating oven. (At 500°F, curing time is only one to two minutes.) And the cured bond can be machined for final touch-up operations.

SEE WHAT 3M ADHESIVES CAN DO FOR YOU!

3M structural adhesives are doing many things in many fields. For more information and literature on the complete line, contact your 3M Field Engineer or write direct: A. C. & S. Division, 3M, Dept. SAY-99, St. Paul 6, Minnesota.

ADHESIVES, COATINGS AND SEALERS DIVISION

MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

The rubber-resin adhesive formulation can be applied directly from the shipping container without additional processing.

Curtain wall panels produced by . . .

Bonding Steel to Styrofoam

A simple broad blade spatula is used to spread the mastic on the assembled pieces of foamed polystyrene.

Low-cost adhesive technique speeds manufacture of steel-faced foamed polystyrene sandwich panels for non-loadbearing curtain wall construction.

Dabs of the adhesive are spread over the core material to achieve the extremely thin coat recommended.

The increasing use of curtain wall installations has brought a bright and colorful face to new building construction in America. In addition, because the panels used in this type of installation are non-loadbearing, they permit more economical assembly and bonding techniques than would be possible under conditions where construction units are required to bear their share of full building load stresses.

For example, whereas a loadbearing wall ranges in thickness from 12 to 18 inches, the decorative tile-face panels prepared by Panel Arts Co., New Orleans, La., for Tulane University's new women's dormitory building were only 1-5/16-inch thick. This significant reduction in the width of the building's "skin" not only made more interior floor space available, but brought about a corresponding weight reduction.

When Ricciuti Associates, New Orleans, designed the dormitory, they established the following specifications for the panels:

1) They had to be durable and structurally strong, providing good flexural strength, impact strength and stiffness.

2) Sufficient insulation against summer heat and infrequent but uncomfortable cold waves had to be provided for.

3) The panels had to be decorative, neat and attractive, and original in appearance.

4) The panels had to be proof against water and frost.

5) Curtain wall units had to be lightweight and compact for easy assembly.

6) They had to be highly maintenance free.

7) The prefabricated panels had to be economical to produce.

The sandwich panels manufactured by Panel Arts met all these requirements. Designated as Panelgrip, they consisted of galvanized 22-gauge steel sheets bonded to each side of a one-inch Styrofoam core with a newly developed, fast-drying reclaim rubber adhesive. Laminated to the outside steel facings were interesting mosaic tile patterns designed by Mrs. Barbara B. Quigley, the company's president.

As manufacturers in this industry know, the crucial factor in any bonded sandwich panel is the adhesive. In setting up for production of the panels for the Tulane dormitory, engineers at Panel Arts therefore spent considerable time evaluating various bonding systems. They finally decided upon a newly developed mastic compound which seemed best to meet the needs of this particular application.

While the obvious function of any sandwich panel adhesive is to hold the facing to the core, unless it is capable of withstanding all the stresses and environmental conditions to which the panel will ultimately be subjected, most if not all of the structural advantages of the panel will be lost. Since the panels are a permanent part of the building, the bond must not deteriorate with age or upon exposure to normal service temperatures. In line with this, the adhesive, of course, must be stronger in shear than the core and must also be able to prevent creep at design load.

Many different types of core materials have enjoyed widespread acceptance: plywood, aluminum and reinforced-paper-impregnated honeycombs, Celotex, Masonite, Foamglas, and various composition boards. However, the use of expanded polystyrene foams is rapidly increasing because of its light weight, durability, and high insulating properties.

Selecting Core Material

For example, in the Panel Arts application, the selection of Dow's Styrofoam as a core material offered a particular advantage in that its extreme light weight—only 2.4 ounces per board foot—made it easy to handle in the various production phases. In addition, this same factor insured easy transportation and installation of the completed panel.

Styrofoam is supplied in rigid plank form and this easy-to-handle shape, coupled with its high compressive strength of 3000 pounds per square foot, made it extremely adaptable. Another important factor in the selection of foamed polystyrene is that the material is not only water-resistant, but can serve as an excellent vapor barrier as well. It will retain its original average insulating value of 0.25 BTU-in./sq. ft.-hr.-°F. over a broad temperature and humidity range.

Finally, and of particular advantage in curtain wall core applications, the material is highly resistant to rot or fungus growth. In line with this is the fact that having no food value, it does not attract insects or rodents.

Where foamed polystyrene is used as the core material, however, adhesive selection becomes more complex. Foamed polystyrene is quickly attacked and softened by most solvent-type adhesive formulations. Other adhesives require considerable heat in order to cure properly and this heat treatment can cause the rigid plastic foam cell structure to collapse.

An alternate solution to this problem, widely used where structural loads are encountered, is to employ 100 per cent reactive, solvent-free epoxy adhesive formulations. This, however, imposed a cost deterrent.

In the manufacture of the unique sandwich panel specified for the women's dormitory of Tulane's Newcomb College, Panel Arts established the following requirements for the adhesive to be used:

1) Low cost.

2) Quick, simple, low-cost production techniques.

3) No special press or heating equipment to be required.

4) Quick drying with good initial bond.

5) Easy application.

6) Minimal attack on the Styrofoam.

7) High bond strength during service.

8) High moisture resistance.

Extensive evaluation programs involving the available adhesives commonly offered for this type of work finally led company production men to test a reclaim rubber mastic adhesive designated as Bondmaster G458. This adhesive was reported to incorporate a special solvent blend which had been formulated to minimize or eliminate cell collapse due to attack on the foamed core material.

The mastic adhesive had already been successfully employed in the manufacture of interior panels for radomes to bond magnesium skins to a foamed polystyrene core. It was therefore obvious that the strengths obtained with this process would be more than adequate for non-loadbearing panels.

The low-cost mastic was available in trowelable viscosity, thus apparently answering all eight of the requirements for this job since quick "grab" and swift air drying were listed as part of the initial adhesive specifications.

Careful pilot evaluation by Panel Arts engineers confirmed all of the above.

In actual production operations at Panel Arts, the planks of Styrofoam were cut to size and then assembled to achieve an ultimate unit size of 58"x27"x1-5/16". Production men

Cut planks of Styrofoam are adhesive-spread on one side and layed out on a coated steel sheet to form a half of the sandwich panel.

In the second step, an adhesive coating is given to the other side of the bonded plastic and a top sheet of steel is set in place.

Colorful mosaic tiles are affixed to the outer face of the completed steel panels by using a conventional adhesive.

found that a broad-faced putty knife was the only tool needed to apply the spreadable adhesive over the face of the assembled Styrofoam pieces and the mating faces of the steel sheets. Since the recommended application procedure called for as thin an adhesive coat as possible, substantial savings for the company were indicated.

A single face of the assembled core unit and a single steel mating surface were adhesive-spread at a time. The coated surfaces were allowed to dry for about 15 minutes. As the solvent was released, the adhesive "film" became quite tacky. During the waiting period, the workmen could prepare and coat materials for additional panels.

After sufficient solvent had evaporated, the coated plastic foam planks and the steel sheet were positioned and combined. To assure proper alignment, a simple corner and side jig was used as one section of the tabletop.

An additional steel sheet and the other side of the Styrofoam blocks were coated immediately and mated after a short drying period. The completed assembly was then stacked overnight. The bond developed in this way is so strong that the Styrofoam could not be removed from the panel without breaking or destroying the foamed plastic.

Subsequent to the assembly of the "sandwich," mosaic tiles were laminated to the steel in large sections, using a conventional mastic. The completed panel is then ready for installation.

While it has been only in the past decade that curtain walls have made their startling growth in building construction, the basic principles have been known for over a century. In fact, even before World War I, panels of asbestos board skins and vegetable fiberboard cores were in use in non-loadbearing applications in building construction.

The relatively recent growth of curtain wall construction started with facade applications or porcelain enamel exteriors on gasoline stations, stores, and old office buildings. The ready acceptance of this type of construction led to the more advanced designing of thin, lightweight, colorful, all-purpose curtain wall sandwich panels and to the development of specialized adhesive systems that would make it possible to mass-produce such constructions.

Note: Bondmaster G458 is a product of Rubber & Asbestos Corp., Bloomfield, N.J.

Making bonds water-resistant by . . .

Modifying Animal Glue with Trimethylol Phenol

By HOWARD H. LEINER
Resin Research Laboratories, Inc.
Newark, New Jersey

The use of glue as an adhesive is as old as the art of bonding two objects to each other. As we know it today, most glue is made from either bones or hides of animals, the latter being preferred because of its strength.

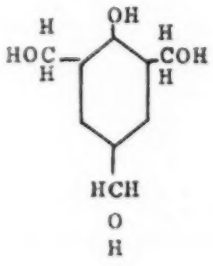
However, glue is a re-wettable solid capable of being dissolved in water after a bond is made. The glue market might be broadened if the cured glue bonds were water resistant. Various agents such as formaldehyde, phenolic resins, etc. have been used in the attempt to insolubilize glue, but have not been commercially exploitable because of the immediate gelation of the glue by these agents.

"Gel Depressants"

Certain materials known as "gel depressants" will, when added to a glue solution, permit the use of reactive phenolic resin-glue blends to provide water resistant bonds. Water resistance of such blends are directly proportional to the amount of phenolic materials which is added to the glue solution at room temperature and applied to the members to be joined. The cure cycle required to produce insolubility may range from several minutes at 325°F. up to several hours at 225°F.

Other important factors in making the blends are the pH of the system and the gel strength of the glue. The effect of pH on the shear strength of a glue resin bond is apparent from the results listed in Table I.

BRL-1030 is the Union Carbide Plastics Company's designation for their aqueous solution of the reaction product of phenol and formaldehyde which is high in trimethylol phenol content.



The three methylol groups can react with glues, starches, sugar and other natural products under the influence of heat and/or catalysts to produce cross-linked, thermosetting resins.

THMP, (tris hydroxymethyl phenol), being highly reactive, causes immediate gelation when added to a glue solution. The prior addition of a gel depressant, such as thiourea, to the glue solution inhibits this gel formation for at least a month. Heat curing will then react the THMP and the glue to produce strong, water-resistant bonds.

Lower gel strength glues permit easier blending with the phenolic material. For example, a mixture of 100 parts of 60 gel strength glue and 20 parts of thiourea in 100 parts of water remains liquid upon addition of 25 parts BRL-1030 solids. When 80 gel strength glue is used, a weak gel forms with the addition of the phenolic but disappears in several hours. With 130 gel strength glue, the gel persists for several days before dispersing.

As mentioned previously, the pH of the phenolic and the glue solutions are highly important. In the example discussed above, the gel produced with the 130 gel strength glue had a pH of about 7. If the THMP is acidified (prior to admission to the glue solution) to a pH of about 3 with phosphoric acid the gel disappears in several hours. An irreversible gelation occurs with 200 gel strength glue unless the pH ot the

About the Author . . .

HOWARD H. LEINER is a graduate of New York's City College and the Brooklyn Polytechnic Institute. He holds several patents in the resin and polymer field and has written many articles. Mr. Leiner is executive chemist at Resin Research Labs.

" . . . it has been determined that low cost glues can be upgraded to compare with higher strength, expensive glues by blending with trimethylol phenol . . . "

Table I—The Effect of pH on Shear Strength

% BRL-1030 (solids)	*pH of Blend*	*Shear Strength (psi)*	*Strength After 30 Hrs. in Water (psi)*
10	4.5	512	158
10	7.0	309	—
25	4.5	407	372
25	7.0	338	239

Note: The following formula was used: 60 gm gel strength glue—100 pts.; thiourea (gel depressant)—20 pts.; water—100 pts.; and BRL-1030—41 pts.

Table II—The Shear Strength of Glue/BRL-1030 Blends

Glue Gel Strength	*% BRL-1030 (solids)*	*Shear Strength (psi)*	*Strength after 30 hrs. water immersion (psi)*
80	0	410	0
80	10	531	155
80	25	324	273
60	0	278	0
60	10	309	—
60	25	338	239
0	10	297	105

Note: Per cent solids of BRL-1030—60 per cent; curing schedule—four inmutes at 325°F. and 140 psi.

Table III—Aging Properties of Glue/Phenolic Blends at 70-78°F.

	A	B
60 gel strength glue	90 pts.	90 pts.
Thiourea	22 pts.	22 pts.
Water	100 pts.	100 pts.
BRL-1030 solution	15 pts.	37 pts.
% BRL (solids of glue)	10 pts.	25 pts.
Viscosity—fresh	1650 cts.	1100 cts.
Viscosity—10 days	2650 cts.	1670 cts.
	C	**D**
80 gel strength glue	100 pts.	100 pts.
Thiourea	20 pts.	20 pts.
Water	100 pts.	100 pts.
BRL-1030 solution	17 pts.	41 pts.
% BRL (solids of glue)	10 pts.	25 pts.
Viscosity—fresh	3800 cts.	3650 cts.
Viscosity—10 days	6100 cts.	5200 cts.

phenolic material is about 3 and the glue solution is kept at about 25 per cent solids. Even with the acidified solution at low solids, a soft gel forms but disappears in about 12 hours. Thus it is obvious that a one or two day storage of the glue/phenolic blends, prior to use, is recommended.

Commercially, some glues must be applied from hot solutions. Obviously, these are the higher (200-400) gel strength materials which need heat to liquefy the gels formed on simple solution. These higher gel strength glues can also be used in phenolic blends when thiourea and heat to liquefy the gels formed on duce a liquid system. The gel which forms when the blend cools will disappear upon reheating to 70°C. The solution has a useable "pot life" of 3-4 hours at 70°C. Beyond this time, a rapid viscosity increase prohibits its use. As in the case of the low gel strength glues, the phenolic resins insolubilize and strengthen the higher gel strength materials when the blends are correctly used.

Low Cost Factor

One of the more attractive features of the glue/BRL-1030 blend is that low cost (ten cents per pound), low strength glues are often upgraded in dry bond strength to equal the better, more expensive, high gel strength glues (25-40 cents per pound) or urea resin glues at a cost of three to five cents per pound of glue. In addition, water resistance of the bond is obtained and heat resistance improved.

Listed in Tables II and III are typical data obtained on testing glue/phenolic blends as bonding adhesives on three-ply birch plywood veneers.

In summation, it has been determined that low cost glues can be upgraded to compare with higher strength, expensive glues by blending with trimethylol phenol. Heat curing the bonded objects under very low pressures will produce strong, water-resistant bonds.

DuPont's John O'Donnel and McCall's Pete Mullin examine a "double" *Digest*. Roller at right center applies adhesive.

Magnified photo of a *Digest* hanging by its covers shows how film of hot-melt adhesive (arrow) welds together pages and cover.

Photos Courtesy of DuPont Magazine

A "Perfect" Binding for the *Digest*

Most periodicals today are still being stapled together either from back to center or through the entire thickness near the spine. Since 1957, however, the *Reader's Digest* has been put together by means of an adhesive technique known as "perfect" binding.

At the McCall Corp. printing plant in Dayton, Ohio, giant presses four abreast and more than two stories high turn out 13,500,000 copies of the *Digest's* domestic issue each month. The book begins as three folded 48-page sections that are twice the magazine's depth.

After the signatures have been gathered in sequence, they are pressed flat and their folded backs are trimmed off flush. Then, held between the plates of a clamp, the signatures travel over the applicating roll of a binding unit and the entire length of each page receives a thin film of adhesive. The latter, a hot-melt developed by DuPont was adapted to the *Digest's* special large-scale needs after more than a year of testing and experimentation. Special equipment had to be designed to melt the adhesive and feed it to the applicator rollers.

As the clamped, glue-spread signatures of the magazine proceed along the binder, a cover fed by another conveyor system is adhered to the spine. The adhesive sets to full strength simply by cooling. Once the cover has been applied, the double-length magazine is transferred by an overhead conveyor to stations at which it is chopped in half, trimmed, wrapped, addressed and mailed.

The new hot-melt adhesive has proven a boon to the McCall's production line. Applied at temperatures ranging from 325°F. to 340°F., it sets within a few seconds. Glues often took several hours to dry by evaporation.

Photo demonstration of the fact that "perfect" bound books can be opened flat and left that way. Here the book is bent back on itself.

Opened books are perfectly aligned and double-page spreads cross the center line as neat and unbroken units.

Mounting of a completed "kaleidoscroll" begins with the positioning of the solid-film thermoplast over the lacquered backing medium. Notice the tabletop alignment fixture.

Next, the wallpaper strip is placed over the solid-film binder and the backing medium.

Photo technique adapted for

Mounting Decorative Scrolls

An unusual laminating process is currently being used in the production of paper "kaleidoscrolls" at Peter Pepper Products, Inc., Palos Verdes, Calif.

Kaleidoscrolls are wall ornaments that are currently gaining widespread popularity among interior decorators —not only because they are attractive, but because no two of them are alike. Their designs are prepared simply by applying dabs of paint with differing colors to strips of plain wallpaper, then folding each strip in the center so as to diffuse the applied coating materials. The strips are next unfolded so that their finishing materials can be dried in a more or less conventional manner.

Each kaleidoscroll strip must then be laminated to a rigid backing medium which allows it to be mounted like a picture on a wall. This could be accomplished without difficulty in several ways if the backing media didn't have to be lacquer prefinished, or if the wallpaper strips didn't have a tendency to become discolored in the presence of many standard adhesives.

Peter Pepper technicians looked in vain for a fluid or paste-type adhesive that would attack neither their facing nor backing laminae. They eventually came to the conclusion that it would be desirable to use a solid-film thermoplast as their bonding agent (since adhesive solvents were among the more obvious sources of their difficulties). This brought up the question of:

Where could they get a thermoplastic film that could be fused under pressure at temperatures low enough to eliminate the possibility of damage to paper and lacquer?

Solid-Film Thermoplast

After considerable research, they decided to try Fotoflat—a solid-film thermoplast used by photographers in mounting prints by a dry process which guarantees neat results.

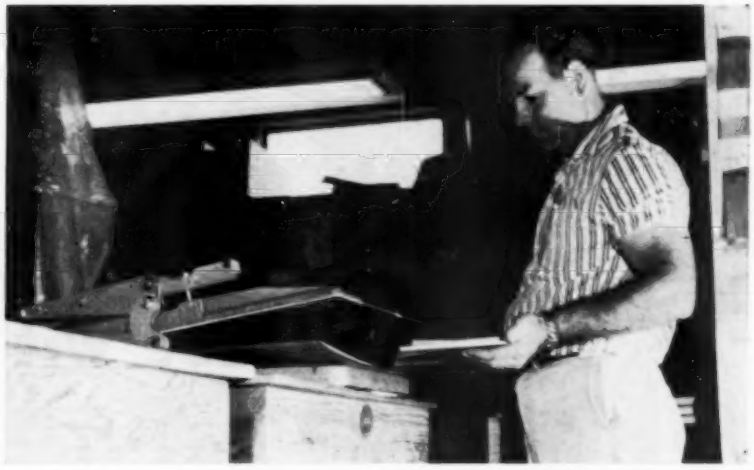
Tests soon disclosed that the latter material could be sandwiched between paper and lacquered surfaces, then fused with an ordinary flatiron so as to make laminates of good quality. This is the way most photoprints are mounted. However, since this procedure was far too tedious for large-scale production purposes, the experimenters subsequently decided to try using a special electrically-heated laminating press made by Seal, Inc., Shelton, Conn., who are also the manufacturers of Fotoflat.

The press didn't completely eliminate the need for a flatiron which is still being used to tack kaleidoscroll laminae together in two or three spots following their alignment in a special fixture. However, the press has made it possible to complete the main portion of each laminating cycle in a period of only ten seconds. During this cycle, the solid-film binder is fused under 25 psi pressure by an upper platen heated to 300° F.

A temperature of 300° F. could, of course, damage either paper or a lacquer coating if maintained for any appreciable period of time. But thanks to a special timing device, the press is automatically opened exactly ten seconds after it is closed on each stack of kaleidoscroll laminae.

Because the paper laminae must fold under the two ends of the panels

In the third production step, the laminae are tacked together with a hot flatiron.



The tacked laminae are removed from the alignment fixture and inserted between the heated platens of an electrical press of the type widely used to mount photographs.

STAFF REPORT

The electrically heated press fuses the laminae at 300°F. and 25 psi. A timer automatically opens the press in exactly ten seconds to avoid damage to the materials.

on which they are mounted, two press operating cycles are employed in the production of each kaleidoscroll laminate. In the initial cycle, the main portion of a wallpaper strip is bonded to the face of the backing medium; in the second cycle, overlapping ends of the strip are adhered to the opposite side of the backing medium.

Good Potential

In addition to saving time and preventing defects in the manufacture of kaleidoscrolls, Peter Pepper's new process permits the production of paper laminates with exceedingly tough and waterproof bonds. Its potential usefulness in laminating other paper products should merit further investigation.

Known in the photographic industry as "dry mounting," the technique is often used by teachers, librarians and audio-visual directors who have found the process to be the fastest, cleanest and most permanent method of mounting and preserving drawings, study pictures, opaque strips and maps.

A mounted kaleidoscroll is examined. Previous techniques employing solvent adhesives damaged either the wallpaper strip or the rigid backing.

STAFF REPORT

CLAMPS for Use with Adhesives

Although the art of woodworking reached a high degree of perfection in Egypt thousands of years before the Christian Era, no evidence has been found of the use of clamping devices, either among the tools found in Egyptian tombs or in the murals on their walls. Some of these murals depict tool operations in woodworking and other trades. One picture shows a man sawing a board, but the board is not clamped. Instead, it is tied with a rope to a post driven into the ground.

Another picture shows the veneer gluing: heating the glue and brushing it on the wood surface. However, instead of using a clamp, the veneer is held in place by piling sand on top of it. On the other hand, the wedge was used to exert pressure even as it is today, not only by the Egyptians, but also by other ancient peoples.

The Screw

The screw, which is now an essential part of nearly all types of clamps, was invented by Archimedes in about 250 B. C. and was used to raise water from a lower to a higher level. It wasn't until about 300 years later that it was discovered that the screw could also be used to exert pressure.

According to Plinius, the Roman scientist, an invention of great technical importance was made about the year 60 A. D. Consisting of a heavy timber frame and two large wooden screws carved by hand, this invention was the screw press. The early screw presses were used for many purposes, such as cloth presses, wine presses and coin presses. Later on, in 1450, Gutenberg used this type of press as the first printing press.

In the woodworking industry, veneer presses with wooden screws have been used for centuries and are still used in many old shops in Europe. Wooden screws are still used for tightening the vises on cabinet makers' benches, and the use of such benches dates back to Roman times. Even today, wooden screws are still being used on handscrews and bar clamps.

The beginning of the modern clamp was the bar clamp which was used by French cabinet makers in the 17th century. It was made of iron but had no screw because screws were still expensive to make. Instead, it had a slide, or jaw, which could be moved along the bar. The work was held between it and the bent end of the bar and the clamp was tightened or loosened by hammer blows on the side.

Wooden bar clamps were used by the early settlers in the United States. Most of these clamps had a wooden screw, which turned in a frame mortised at right angles into a wooden bar. Wedges or round pegs could be fitted into the bar at regular intervals.

The all-metal bar clamp was first used in Europe about 1876. The slide was held in position on the bar with a steel pin passing through holes drilled in the bar.

Hand Screw Clamps

One of the oldest of the modern clamps is the adjustable hand screw clamp. Its style, shape and purpose has not changed through the years. However, there has been a number of improving refinements made to this clamp by several manufacturers. The handscrew was first made with wooden spindles of the type still used by the Despres Dowel Mfg. Co.

A typical band clamp such as seen here finds extensive use in the furniture industry.

However, steel spindles are more widely used by such manufacturers as the Cincinnati Tool Co., Wetzler Clamp Co., Adjustable Clamp Co., James L. Taylor Mfg. Co., and Black Brothers Co.

All the manufacturers use seasoned hard maple for the jaws of the clamp. These hard maple jaws hold tight over a broad area and will not mar highly finished surfaces. The Wetzler Clamp Co. has equipped the jaws with soft metal glue shield protectors. According to the company, this glue shield will not mar finishes and permits the removal of run-over glue in seconds. Some spindle handles are fluted while others are plain hard maple. It is claimed that fluted handles give a better grip to the hand, however, reports indicate that plain handles give ample power and grip.

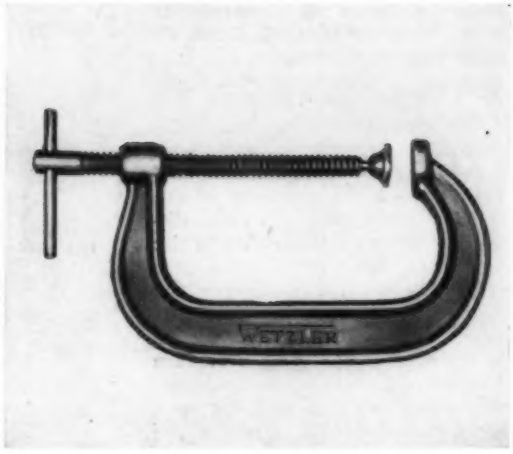
Band Clamps

The most widely used styles of band clamps are made of either canvas or steel. Such band clamps serve in many applications where the clamping of round or irregularly shaped sections, such as furniture frames, aircraft assemblies, tanks or columns, presents a difficult problem. The canvas band is recommended by the manufacturers for most applications since it is more easily handled and does not kink. The steel band should be used on round shapes only. Both bands are quickly adjustable through the screw head, and self-locking cams hold the band securely up to the strength of the band itself. The locking device maintains even pressure and an automatic release frees the band instantly.

The chain or column clamp can also be considered in the band clamp category. It is also used for clamping all sorts of rounded forms, such as wood columns, table pedestals, cylinders and concrete forms. The clamp consists of an iron head through which is passed a heavy steel screw with a welded chain attached. The chain is hooked to the opposite side of the block, and pressure is applied by tightening the screw.

"C" or Carriage Clamps

The "C" or carriage clamp, usually made of malleable iron or alloy steel, gets its name from its shape and its use by horse carriage makers years ago. "C" clamps are probably the most widely used type of clamp today. They are produced by a variety of manufacturers in a variety of designs. As a result, characteristics in service and actual quality vary to a considerable degree. These clamps have a very definite place in many kinds of applications if selected and used properly. In many instances, however a handscrew or a bar clamp will do the work better and more conveniently.



The "C" clamp is probably the most widely used clamp today.

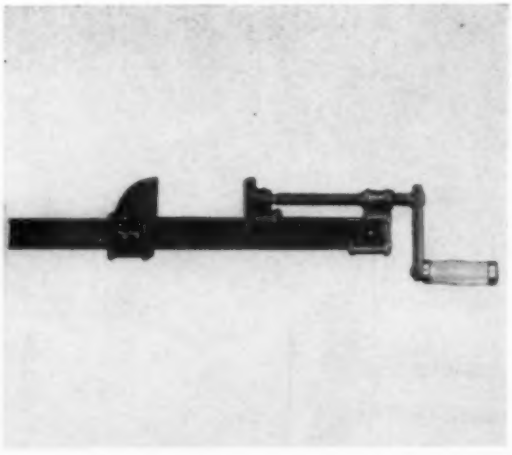
Using the "C" Clamp

The manufacturers suggest that if the use of "C" clamps is indicated, it is important that the proper clamp be employed for the work at hand. Using a large clamp on small work throws an abnormal strain onto the clamp screw and frame. The clamp should have as small a depth of throat or reach as the work will permit. This will minimize the stress on the clamp and provide greater clamping power. The requisite characteristics for perfect service are high tensile strength, high elastic limit and yield point, and exceptional resistance to shock.

Bar Clamps

The bar clamp is used for clamping over comparatively wide work. They come in two types: steel and wood. The wood bar clamp is the basic clamp for most cabinet work. It offers the craftsman a light wood bar for use on the finest class of cabinet work, upholstery, antique repair, and other exacting work. It is the bar least likely to accidently injure finished surfaces.

For bar clamps of greatest all-round usefulness and economy, clamp fixtures are the most popular. They make ideal, fast, operating bar clamps on ordinary black pipe of any length. They are quickly adapted from one length to another with the use of tools of any kind, with only the regular pipe threads required for assembly. Clamp fixtures for wood bars are also in wide use. In many workshops, steel bar clamps are replacing "C" clamps because they come in a great number of lengths and reaches. Steel bars are reported



The bar clamp finds use when wide areas are to be bonded together.

to permit instant adjustment to the work, fool-proof operations, and require simple maintenance.

Miter Clamps

The miter clamp is primarily intended for flat miter joints such as are met with in interior trim and cabinet work. In a survey of the field of miter clamps, it was discovered that no two are alike in size and shape, however all the clamps serve their purpose. In the operation of the miter clamp manufactured by Black Brothers, pressure is applied to the miter by grasping it between a steel triangle and two mitered jaws. The latter move in and out on a screw threaded right hand on one end and left on the other.

Several positions for the triangle are provided on the bar, making for rapid adjustment to miters of different widths. This clamp applies pressure at right angles to the surfaces to be joined. The clamp can be used either singly or in multiples. As many clamps as needed may be arranged in any desired conformation, in which case they are held in place on a rail by a holder which attaches to both the clamp and the rail.

The Taylor miter clamp is Y-shaped. With this clamp, work may be held exactly square. The jaws are planed true, and the pins are only long enough to give a grip that prevents slipping. The eccentric allows the first motion to bring the jaws into engagement quickly, and the latter part closes more slowly, giving positive holding power.

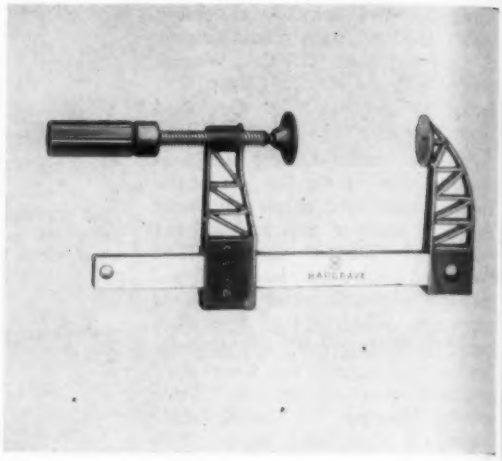
The Jorgensen miter clamp, manufactured by the Adjustable Clamp Co., is especially designed for mitering flat casings where a ⅝-inch diameter blind hole can be bored in the back of each piece. It forces the two ends being mitered directly against each other, no matter what the angle, with no tendency for the ends to creep along or away from each other.

Stanley Tools' miter and corner clamp works on the outside of the corner and fully exposes both sides of the joint. This type of clamp allows fastenings wherever desired, and permits the wiping away of excess glue before it dries. The clamp has a three-inch capacity which permits it to hold stock of different widths and thickness at the same time. The clamp contains two counter-sunk screw holes for fastening to a bench top, and a slot in the center of the clamp permits using a saw to true-up uneven miter cuts.

The Hargrave miter-frame clamp, manufactured by the Cincinnati Tool Co., clamps all four corners at one time. This clamp can be quickly adjusted to any square or rectangle desired from 2 to 14 inches.

The Wetzler Clamp Co. manufactures a universal clamp which can be used for miter and corner work. It contains freely movable swivel plates which adjust easily to curved or beveled edges. Two pressure clamps hold the wooden parts to be joined. A horizontal spindle enables side adjustment for pulling the joints together with one hand, leaving the other hand free for gluing.

Miter joints can also be made using a variety of clamps at the same time. This can be done by clamping blocks to the stock and applying pressure.



The quick clamps are especially useful in pattern making.

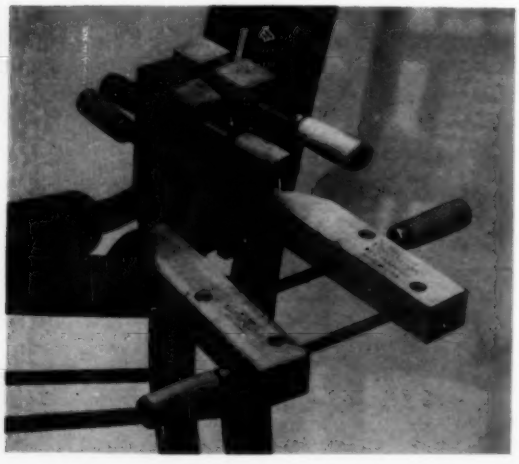
Quick Action Clamps

Quick action clamps are of construction similar to bar clamps. They are especially useful in pattern making, boat and shipbuilding, automobile body assembly, and general woodworking, where a clamp must be instantly applied.

The edge or cross clamp is designed for use with either a deep reach bar clamp or a quick action clamp. It provides a means of applying pressure at right angles to the axis of the bar of the clamp to which it is applied, for gluing, for drawing joints together, or for pressing on the edge of work without having to reach all the way across the work.

Spring Clamps

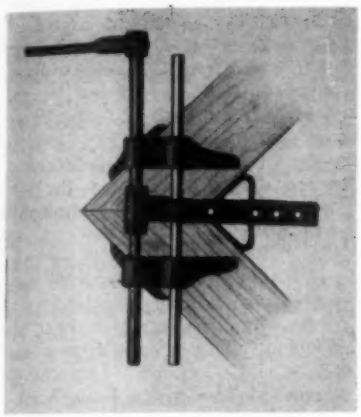
Spring clamps are light, inexpensive tools and can be used wherever relatively light pressure is adequate, and especially where fast application and removal of clamps is an advantage. These clamps are popular because they can be applied and removed quicker than any other type of clamp. The clamp is usually made

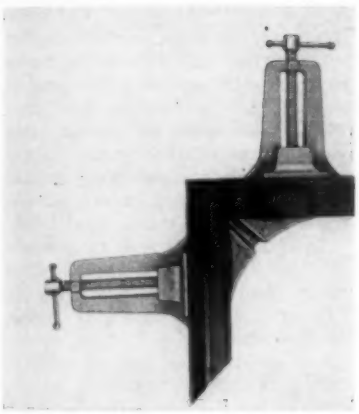
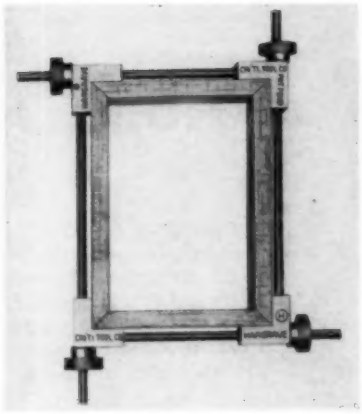


The adjustable hand screw clamp has not changed much through the years.

The Editors wish to thank the Cincinnati Tool Co., Cincinnati, Ohio, for its permission to use much of the material contained in its booklet, "Clamps—Their History and Their Uses."

Mitre Clamps Are Produced in Many Sizes and Shapes



of steel and contains a strong spring of tempered steel.

Glue Clamp Carriers

A glue clamp carrier must be a rugged machine because the very nature of its use subjects it to very severe strain. Used for face gluing in building up posts, squares, or for stock to be band sawed to shape, the glue clamp carrier will produce edges having perfect contact throughout the full length of the stock. Clamp carriers are made in a practically unlimited range of sizes with respect to the number and width of sections, the number, length and style of clamps, and no single frame design is correct for them all. The height of the frame should conform to the length of the clamp, and its load carrying capacity must be proportioned to the weight of the clamps and stock in the machine.

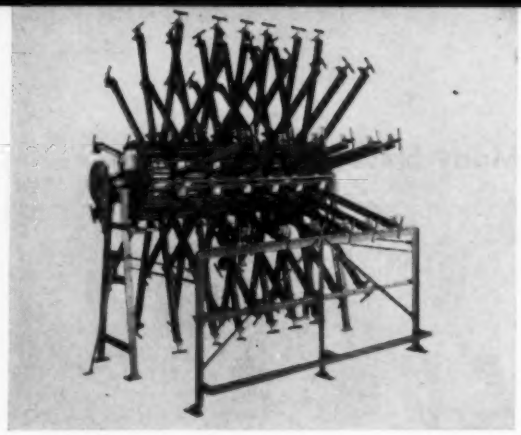
The heart of any clamp carrier is the individual clamp. It must be strong for heavy pressure yet not unwieldy. A majority of the clamps manufactured work on the draw screw principle. Such a clamp is one in which the front jaw is stationary and rigidly fastened to the clamp bar. The pressure is applied by drawing the rear jaw up against the work. The stationary front jaws are in line and form a straight edge to clamp and align the work against. If this were not the case (the clamps being fastened to the carrier and not free to move like individual clamps), they might readily be drawn up unevenly, causing serious distortion in both the clamps and the work. For general purposes the draw screw clamp has made the wide application of the clamp carrier possible.

Piling Clamps

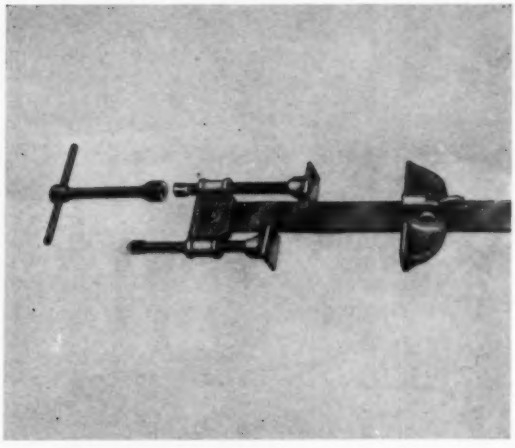
On straight production work, a piling clamp system will generally not equal a clamp carrier in output, and where the volume is sufficient to justify it, a carrier is usually the logical choice. However, occasionally there may be special conditions such as a large percentage of long work beyond the range of the ordinary carrier, or work with a multiplicity of joints, which tend to minimize the time required to handle the clamps as compared with the time required to handle and arrange the stock. In such cases the efficiency of piling clamps may equal or even surpass that of a high grade clamp carrier.

The piling clamp system has speed, durability, does perfect work, and is one of the most versatile clamping systems ever devised. It clamps any thickness, any length, and has no fixed distance between the clamps. There are no posts, guides or other obstructions, but a clear clamping surface at all times. The clamp consists of a steel frame into which are built two independently operated screws: one screw operates jaws to clamp the work below the clamp itself, and the other screw clamps the work above the clamp. Each layer of work, therefore, is clamped from above and below, eliminating the tendency for the work to buckle, as it might if clamped from only one side.

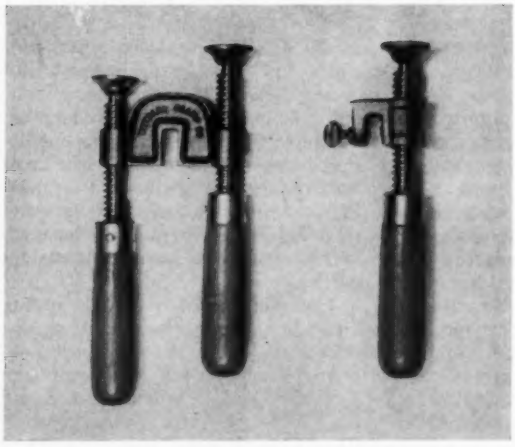
To build up a pile, use is made of



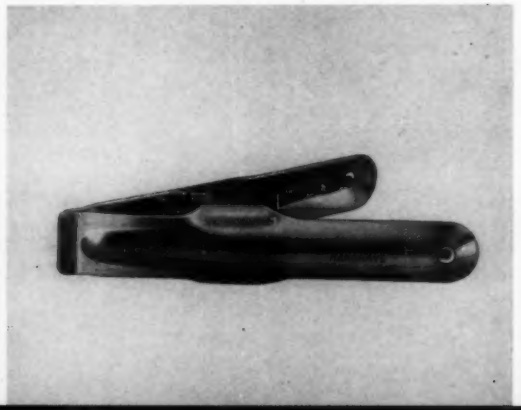
The clamp carrier speeds up production techniques.



The piling clamp is extremely versatile in operation.



Edge clamps provide a means of applying pressure at right angles.



Spring clamps find use where light pressure is adequate.

a suitable truck, bench or platform to which two or more clamps are attached by means of the lower clamping jaws. The first course of boards to be glued is laid in the upper jaws. Two, or as many more clamps as are required, are placed on top of the work and the lower jaws are tightened. The second course of joints is then placed, and by repeating the operation, the pile can be built to any required height.

Glue Press Frames

It is unthinkable to operate any type of woodworking shop, no matter how small or large, without an adequate supply of hand screws, bar clamps, "C" clamps, and other clamps. Modern materials and methods make it almost as essential to have a glue press frame. The press frame applies great pressure on flat surfaces that are difficult to clamp well by other means. This unit is particularly important in these days when urea resin or plastic resin glues are so commonly used; these glues, which are excellent, durable adhesives, require a great and uniform pressure to insure good joints.

In addition to the ready-made glue press frame, there are individual press screws which are used in smaller shops to construct home-made press frames. These screw-made press frames can be used in facing standard plywood panels, table or counter tops, and other work with Formica, Micarta, hardboard and similar materials, and are easy to construct.

Clamp Use and Care

The proper use of clamps is, to a great extent, obvious and a matter of applying common sense. The finest clamp, like other fine tools, can be ruined by rough handling, improper job selection, and overloading. Clamps should be kept on a rack when not in use, and kept clean at all times. A light lubrication of all moving parts will insure longer service and smoother operation.

In selecting the clamp best suited for the needs of a given application,

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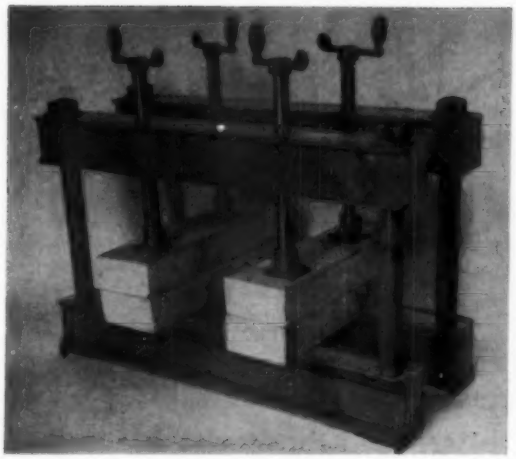
The Editors wish to thank the following companies for their cooperation in the preparation of this article:
Adjustable Clamp Co., 429 N. Ashland Ave., Chicago 22, Ill.
Nels J. Billstrom Inc., 1844 18th Ave., Rockford, Ill.
The Black Bros. Co., Inc., Mendota, Ill.
Cincinnati Tool Co., Norwood, Cincinnati, Ohio.
Despres Dowel Mfg. Co., 1738 Elizabeth NW, Grand Rapids, Mich.
Grand Specialties Co., 3101 W. Grand Ave., Chicago 22, Ill.
The Stanley Works, 195 Lake St., New Britain, Conn.
James L. Taylor Mfg. Co., 108 Parker Ave., Poughkeepsie, N.Y.
Wetzler Clamp Co., 43-15 11th St., Long Island City 1, N.Y.

the following factors should be considered: (1) the depth required; (2) the opening required; (3) the strength and weight required; (4) selection of a screw length proportionate to the job's needs; (5) the type of handle best suited; and (6) evaluation of the clamp operating time against the clamping need—is a spring clamp, "C" clamp, handscrew clamp, etc. required.

By tracing the development and usages of clamps into the medieval and modern times, one can readily understand how contemporary clamp sizes, shapes and applications have evolved. Although basically of the same design-principle, our modern clamps are stronger, more efficient, and more economical to use.



The glue press frame applies great pressure on flat surfaces.

A 3800-Gallon Tube of Glue

Giant rubber-fabric containers that look like overgrown toothpaste tubes are making it possible for the Arcata Plywood Co., Arcata, Calif., to cut the cost of hauling liquid glue by about $200 a trip.

The rubber bags, called Sealdtanks, are a product of the United States Rubber Co. They make it possible for a truck setting out on a two-way haul to carry dry cargo in one direction and liquid cargo on the return trip.

"At first," recalls Ted Bieberstein, secretary for Arcata, "there just didn't seem to be any way we could avoid the expense of having the glue brought up to us in a big metal tanker truck. When we heard of the rubber bags and saw that they might allow us to do our own hauling, we decided to give them a try."

Flat-bed trucks are used to haul the glue from the South San Francisco shipping yards of Reichhold Chemicals Inc. On the 300-mile run south from Arcata they carry a load of finished plywood. Previously the company had to send an empty tank truck to pick up the glue.

Extended rubber tank is shown being filled for shipment on a flat-bed truck. When empty the tank can be folded and stored in the truck's forward section.

The conventional method of making bulk liquid shipments is, of course, to use metal tanks trucks. These vehicles can, however, be fairly expensive to keep on the road if they are forced to make one leg of the journey with no cargo.

On the other hand, when the rubber Sealdtanks are empty they can be rolled into a cylindrical package 25 inches in diameter by seven feet four inches in length. The flat tube can be stored in the forward section of the trailer which is then loaded with a dry cargo.

The tubes when spread out are 56 inches wide by 35 feet long. They hold 3800 gallons of liquid. Empty a rubber tube weighs 1040 pounds, filled they may weigh 22 tons.

"Our experience in using these rubber tanks to haul liquid glues has so far been satisfactory," reports Mr. Bieberstein. A forklift is used to load and unload the empty tubes. Though they are quite heavy, two men can fold an empty tank so that a forklift can take it off the truck and store it until it is needed for further hauling.

Cleaning the interior of a tube does not present any problem as long as one type of adhesive is being run. When the tanks have to be cleaned, however, they are filled with water which is then slushed around the interior by driving the truck around the block or by having a man walk on top of the tank.

Hot Spraying of Adhesives

Luggage manufacturer uses a streamlined technique to speed and facilitate vinyl-to-magnesium bonding.

Bonding vinyl sheeting to magnesium was one of the important steps that Shwayder Brothers, Denver, Colo., had to work out in the manufacture of their new luggage line, Samsonite Silhouette.

The newest addition to the company's Samsonite line is made by mating two deep-drawn magnesium shells and covering them with vinyl plastic sheeting. The process seems simple enough, but many production and design problems had to be worked out by the company before the final configuration and manufacturing techniques were decided upon.

"One of our principal problems was in getting the right amount of adhesive on the magnesium shells," says Dick Sandburg, head of the Research and Development Laboratory. "To meet our production requirements, the adhesive had to be sprayed on. We tried cold spray, and used that method for some time."

Cold Spraying Problems

However, several problems were inherent to cold spraying. For one, it was difficult to obtain a uniform heavy coating. To bond the textured or rough surface of the vinyl to the magnesium shells, it was necessary to apply a rather thick coating of adhesive. Thickness uniformity was hard to control, because the coating would sag due to the low solids content of the bondant when reduced for the cold spraying operation.

Then, too, the operation was generally critical; employees continuously experienced difficulty. "Hot spraying of adhesive seemed to be our only answer," Sandburg points out.

Fortunately, the decision to change to hot spraying coincided with the introduction of a new material heater by Binks Manufacturing Company, Chicago, Illinois. Originally designed for use with Binks spray painting systems, the heater proved to be ideal for the Shwayder Brothers application.

The technique made uniform adhesive thickness easy to control and eliminated the sagging problem. In addition, rejects were fewer, a 12 per cent adhesive saving effected, and reducer solvent usage was cut. Most important, hot spraying took the adhesive application operation off the critical list and, in so doing, solved the major problem the company had experienced in the manufacture of the new line.

The heater also yielded other benefits, most of them traceable to its unique design incorporating a center-located electric heating element surrounded by a finned tract. Heat generated by the element passes outward through the material flowing in the tract, the fins providing maximum surface area for maximum heat absorption.

Because of the maximum heat absorption a lower wattage heating element can be used. In addition, bake-out is virtually eliminated, which means down-time for cleaning is held to a minimum. The unit can thus easily keep pace with Shwayder's production schedules.

Prior to arriving at the spray booths, the magnesium shells undergo a thorough cleaning and surface preparation treatment. In the first step, the shells are subjected to a water spray rinse, with water temperature held at 210°F., to rid them of the drawing compound. They then go through a two-stage treatment involving the use of special cleaners.

The first phase removes drawing compound residue, plus any foreign matter. The second phase of this treatment is the application of an alkaline cleaner to remove any magnesium scale. This is followed by a hot water rinse, at 160°F., to do away with the cleaning solution.

The next step is the equivalent of phosphatizing steel. It consists of treatment with sodium dichromate, a chromic acid base that converts the alkaline surface of the metal to an acid surface necessary to get a good adhesive bond. This is followed by a cold rinse, a hot rinse, and then a drying period in an oven. All of this process is conveyorized. As the parts leave the drying oven, they cool off on their way to the spray booths.

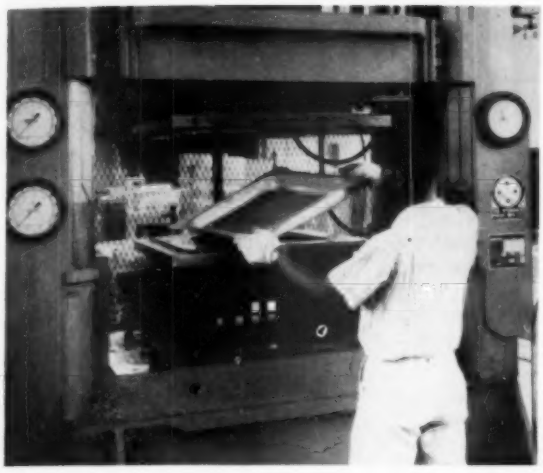
Spray Booths

All of the magnesium shells have the adhesive applied by the spray system. Two Binks booths are located at the end of the cleaning system. As the shells pass by on a conveyor, they are removed and placed on a revolving table in one of the spray booths. The spray operator then rotates the table. As it turns he sprays the adhesive onto the shell, coating it completely on one side. The shell is then replaced on the conveyor.

Still on the conveyor, the shells are passed through another oven. Time in this oven is three minutes, during which the shell with adhesive applied, is brought to a temperature of 140°F. This heating process evaporates the methyl isobutyl ketone reducer in the adhesive.

At the end of the oven, the shells are transferred to another conveyor for application of the vinyl cover which has been previously adhesive spread in a Chambers mat coating unit. Using special equipment designed by Shwayder engineers, the covering is adhered to the magnesium

Preliminary Steps in Bonding Vinyl to Metal

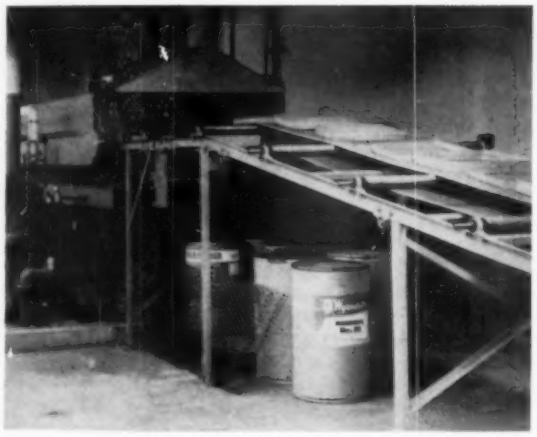


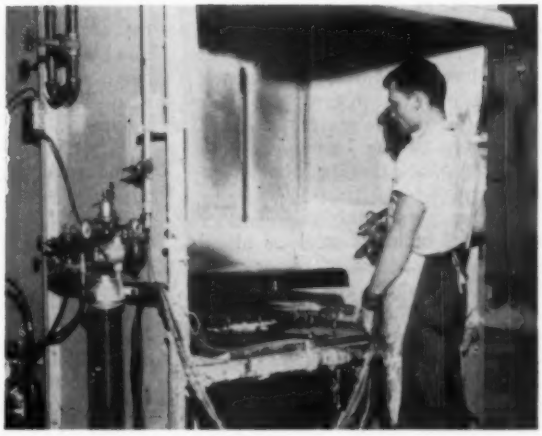
1. The first production step is the formation of the magnesium shell, left, in an hydraulic press. The edges are then trimmed smooth.

2. Magnesium shells are conveyed through a cleaning operation, center left, that prepares the surfaces for the application of the adhesive.

3. The adhesive is applied in spray booths such as the one shown in the photo center right. The reducer solvent is then driven off in an oven.

4. Adhesive-coated vinyl sheets which will form the luggage covering are shown, bottom, being removed from the conveyors of an infrared drier.





shells using heat and pressure. The resulting adhesion is stronger than the vinyl sheeting which gives the covering the durability needed. The parts are then shuttled to another station for trim and eventually assembled.

The adhesive used for the bonding operation is made by DuPont. It is premixed in the company's paint mixing room in 60-gallon Binks pressure containers and then rolled on dollies to the spray booths. The mixture consists of 42 gallons undiluted cement added to 18 gallons methyl isobutyl ketone.

Two tanks are kept on hand, so that a constant supply of adhesive is available. Changeovers are effected by merely switching the housing. Normal usage of adhesive on a two-shift arrangement is around 120 gallons per day, and a normal day's production for two shifts is around 6000 smooth and trimmed magnesium shells per day.

From the supply tanks, the adhesive goes to the heater, thence to the spray guns. Adhesive temperature is closely controlled at between 150-160°F. Tank pressure is regulated at 15 psi, air pressure is regulated at 30 psi. Air from the plant system is used. Binks Model 7 spray guns are used with 36P nozzles for spraying the adhesive.

An additional advantage of hot spraying is that fluid flows easier, permitting the use of ¼-inch hose, displacing the larger hoses previously required. This results in less operator fatigue.

"We evaluated a great deal of the equipment on the market," says Sandburg, "before deciding on our present setup. For our purposes, it looked like the best buy, both from a cost and performance standpoint. Six months of operation has not disproved us."

Although the average Samsonite Silhouette buyer probably will never know what processes lie behind the product, he will certainly benefit for years by having a product that will stand the test of years, and the abuse of wear.

"Peelable" Laminated Metal Shims

The use of polyester styrene resin as a bonding agent permits the manufacture of a laminated shim which has found numerous uses in modern industry. Known as Laminum®, this unique material is made exclusively by the Laminated Shim Company, Inc., of Glenbrook, Connecticut.

Composed of precision gage laminations of stainless steel or aluminum in thicknesses of either .002" or .003", the shims are held together in an apparently solid mass by a microscopic binder of polyester styrene resin of the paraplex series. They look and act like a solid metal, yet the layers can easily be peeled off by hand, utilizing nothing more elaborate than a penknife.

Least Costly Method

This is in contrast to any number of more costly methods of adjusting actual solid shims, including grinding, filing or machining. Each lamination in a shim is exactly the same gage; when a lamination is peeled off, the remaining part is always uniform in thickness, from end to end, its surfaces glassy-smooth, clean, flat and parallel. As the requirement of the particular assembly dictates, any number of layers can be peeled from basic total thicknesses of from .015" to .126".

The Laminated Shim Company has manufactured brass and steel laminated shims for nearly 50 years. In the beginning a metallic (solder) bond was used between layers. With the requirements of the space age, however, the need for lighter and corrosion resistant materials was evident. This brought about the development of aluminum and stainless steel laminated shims, which have found wide use in aircraft, missiles, jet engines, electronics, motors and many other fields requiring precision adjustments.

Laminum® sheets of stainless steel and aluminum are made up in widths up to 24", and lengths up to 48". In the manufacture of sheets of either material, the 24" wide laminations are coated with the plastic binder, and piled in groups representing the thickness of the final sheet. For example, 16 layers of .002" stock are used to manufacture a sheet 1/32" thick.

These groups are placed on the bed of a platen press which is heated while applying pressure to the laminated stack. After a period of time sufficient for curing the resin binder, the laminated shim stock is removed from the press and trimmed. A slight build-up is noticed between the resin-bonded laminations, of approximately .0003" per layer. In 1/16" thick units composed of .003" thick shim material (twenty-one layers) total build-up is about .006".

Some out-of-the-ordinary uses for laminated shim stock that are not so readily apparent include the use of a laminated shim peeled to more than one thickness, thus replacing several individual shims. For example, since the forgings of aircraft applications may have a manufacturing tolerance of nearly .060", there are gaps which must be shimmed in the assembly jig. To maintain a conformity to the basic contour line of the structure within .010", the shims are adjusted in quarters.

First, the thickness required for each quarter of the area to be filled is measured; then the shim is scored into corresponding quarters with a penknife. The necessary number of laminations can be peeled from each individual section without disturbing the remaining three sections.

Tack Bonded Shim

Another special type of laminated shim utilizing a plastic bond is the so-called "Tack Bonded" shim, manufactured by the same company. In this type of shim, individual layers are bonded around the outside edge of the layers, with a rubber based plastic, in much the same manner as a scratch pad is held together at the top.

Aluminum accounts for virtually 75 per cent of the shim material used in helicopter and aircraft production, according to a recent study. Selection of this metal plays an important role in the over-all weight factor, so important in aircraft planning.

Stainless steel, meanwhile, affords considerable corrosion resistance, and has found uses primarily in electronics.

Adhesive Bonding to Graphite

By JOHN J. VELIKY and MICHAEL J. BODNAR

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Picatinny Arsenal
Dover, New Jersey

A preliminary literature survey revealed that very limited information is available on the impregnation and bonding of graphite. It is apparent from current publications that extensive investigations for the utilization of graphite in missiles, heat exchangers, nuclear reactors and other items of potential interest to the Ordnance Corps are being pursued.

It was therefore decided that a preliminary investigation be initiated to establish bonding techniques for fastening graphite to steel. From the bonding of compressed graphite to steel, there evolved an investigation of feasible methods to impregnate compressed graphite in order to improve its properties at high temperatures.

This article covers both the bonding of compressed graphite to metal with organic polymeric adhesives, and the impregnation of compressed graphite with organic polymeric resins.

1—Bonding graphite with organic adhesives

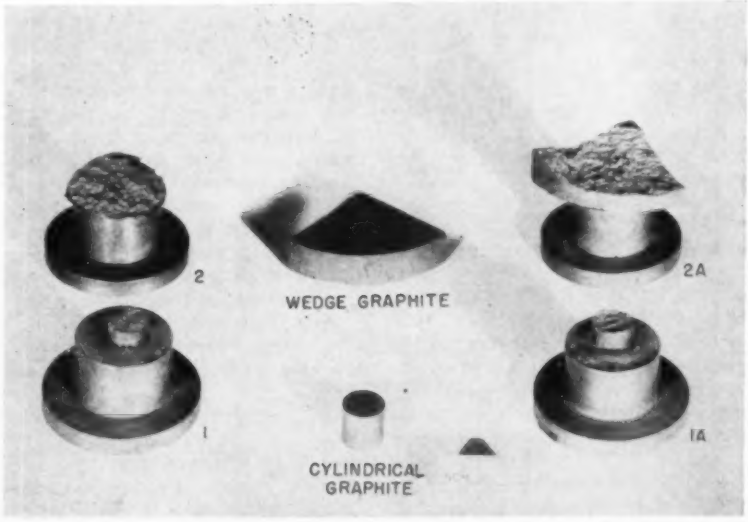
Adhesives were found to be highly effective for bonding compressed graphite to metal. Average tensile bond strengths of 1447 psi were obtained with a modified epoxy adhesive; a furane resin provided bonds in excess of 1130 psi. In both instances the mechanical strength of the graphite was readily surpassed.

This investigation was conducted to determine the adhesive characteristics of various types of organic polymeric adhesives to a graphite surface. The compressed graphite discs used for this program were of two types which are currently used in high temperature applications. The types of discs differed slightly in particle size and porosity which undoubtedly accounted for the difference in bond strength obtained even though failure occurred constantly in the graphite itself.

Of the pretreatments of the faying surfaces of the compressed graphite used, both chromic-acid immersion and the Bunsen burner flame surface pretreatments of the graphite prior to adhesive bonding had a deleterious effect on its mechanical strength.

Tensile specimens were prepared in order to select the better adhesives and surface pretreatment method of the adherends pending further investigation. The adhesives selected were the solventless, room temperature curing types. These included a modified epoxy, a furane, and a styrene-polyester. These adhesives were selected because they represent one of each type of solventless, room temperature curing adhesives that are known to possess good adhesive and cohesive properties.

Heat-resistant adhesives were not evaluated at this time since only a feasibility study of the degree of ad-



Tested graphite-to-steel tensile specimens which were bonded with polysulfide-modified epoxy adhesive

nesion available to graphite with common polymeric types of organic resins was desired. Once the degree of obtainable adhesion was established, high temperature adhesives could be evaluated for the bonding applications. Phenolic-epoxy types of adhesives would likely be effective in bonding graphite for high temperature applications. These adhesives of course would require an elevated temperature cure.

The adhesives evaluated further in this investigation were the modified epoxy and the furane type resins. The styrene-polyester was deleted from the test program because tensile bond strength values obtained with this adhesive averaged only 928 psi. For the furane resins a special pretreatment method of the adherends was essential for promoting an effective bond between compressed graphite and steel.

Excellent adhesion of the graphite to steel was obtained when using the modified epoxy resin. Storage of the epoxy bonded graphite to steel specimens for seven days at 160°F, prior to testing at 73°F, did not deleteriously affect the bond strengths. The bond strength obtained with this adhesive always exceeded the cohesive strength of the compressed graphite.

Good adhesion was obtained with a furane type adhesive. During the coating of the adherends with the furane resin, it was observed that the graphite absorbed much of this adhesive thereby producing starved adhesive joints. Low test values resulted. These were attributed to the absorbing characteristics of the graphite and the unbonded areas which were obtained.

The process was modified by using two coats of furane resin to eliminate the presence of starved joints caused by absorption. One coat served as a sealer, whereas the second coat served as the bonding agent. The average bond strength obtained with the two-coat procedure was in excess of 1130 psi as compared to 585 psi obtained when using only a one coat application of the furane type adhesive.

Tensile Strength at 73.5° F. of Graphite Bonded to Steel with Polysulfide Modified Epoxy Adhesive

Specimen	*Cure Time*	*Load, psi*	*Graphite Failure, %*
1	14 days at 73.5°F	1480	100
2	14 days at 73.5°F	1478	100
3	14 days at 73.5°F	1478	100
4	3 days at 73.5°F, 7 days at 160°F, 3 days at 73.5°F	1478	100
5	Same as 4	1480	100
6	Same as 4	1482	100

Note: Graphite was vapor degreased in perchloroethylene prior to adhesive application.

Modified epoxy and furane type adhesives can readily be utilized for bonding graphite in applications where temperatures do not exceed 160°F. It is inferred that heat resistant adhesives could be used for securely fastening graphite to metals for high temperature applications, such as missile fins, since adhesives allow uniform distribution of stresses in the brittle graphite. It is also inferred that graphite impregnated with the proper polymeric substance would provide a superior structural material which could be effectively utilized for high temperature applications. This second assumption is based upon the experiment described below.

2—Impregnating graphite with macromolecular substances

It appeared feasible to improve the properties of compressed graphite of the proper grade for use in high temperature applications by impregnating it with a low viscosity resin or with a gas which would be polymerized in place.

The gas impregnating method would involve the diffusion of an organic gas into the interstices between the graphite particles. Under certain conditions the gas could then be polymerized in place. This method would be somewhat analogous to the polymerization of ethylene gas to form polyethylene. If the proper impregnation and technique were found, the following advantages would be realized:

(A) The thermal insulating characteristics of the porous compressed graphite would be increased considerably.

(B) A cooling effect would occur on the graphite surface when that surface was subjected to high temperature. This would be the result of depolymerization of the impregnating resin, since depolymerization is an endothermic reaction.

(C) The evolved gases during depolymerization would act as a heat-resistant barrier by providing an insulating gaseous layer between the graphite and the atmosphere.

(D) The resin binder would reduce the brittleness of the graphite, thereby improving its mechanical properties.

In the course of the bonding investigation with furane adhesive, it had been observed that the compressed graphite absorbed the adhesive readily under normal atmospheric pressure. On the basis of this observation a preliminary investigation of the impregnation of the graphite was initiated with a number of relatively low viscosity resin adhesives to substantiate to a limited degree the assumption made in the preceding paragraph for improvement of graphite properties.

Two processes for the impregnation of compressed porous graphite were utilized. One process involved impregnation through vacuum, and the other process involved the use of a positive pressure of approximately 65 psi.

From the results of this limited investigation, it was observed that the impregnation of the porous compressed graphite with a phenolic resin increased the insulating characteristic of the porous graphite disc. The impact strength of the phenolic resin impregnated graphite was more than twice as great as the non-im-

pregnated porous graphite which was used as the standard specimen for correlation of results.

Porous compressed graphite discs were impregnated under approximately 30 inches of mercury vacuum with one of several different organic polymeric adhesives. Each disc absorbed approximately ten per cent of the low viscosity resins. The resins used in this test included epoxy, cyanoacrylate, and phenolic types.

The graphites impregnated with the epoxy and the cyanoacrylate resins burst into flames and shattered into numerous pieces on subjection for a short period of time to a Bunsen flame which registered 970°C. The epoxy impregnated graphite withstood the high temperature for approximately five minutes, whereas the cyanoacrylate burst into flames within one minute.

The phenolic resin impregnated graphite did not burst into flames nor shatter into fragments when subjected to the Bunsen flame for ten minutes at 970°C. In fact, the phenolic adhesive improved the erosion and corrosion resistant characteristics of the graphite in addition to increasing considerably the insulating characteristic of the porous compressed graphite. It is highly significant to note that the impact strength of the compressed graphite was more than doubled when impregnated with only ten per cent phenolic adhesive.

Further testing and improved techniques must be developed for the high temperature missile applications described at the beginning of the article. However, on the basis of the limited tests described here, it appears feasible that high temperature adhesives and resins can be utilized for improved graphitic structures. It is probable that porous compressed graphite impregnated with a heat-resistant phenolic resin and bonded with a heat resistant polymeric adhesive can be utilized for high temperature applications.

About the Authors . .

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JOHN J. VELIKY has a B.S. degree in chemistry from Seton Hall University. He has done graduate work in polymer chemistry at Stevens.

Gummed Tape Problem Uncurled

Simple bi-flexing operation cracks smooth film and helps make the tape lie flatter

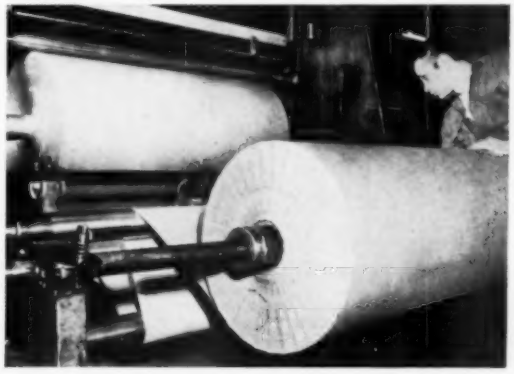
By taking the "curl" out of gummed sealing tape, Atlantic Gummed Paper Corporation, Brooklyn, N.Y., reports that it is building-in a dollar saving bonus for customers by reducing waste.

In the Atlantic production technique, kraft paper made by the Hollingsworth & Whitney Division of Scott Paper Company is processed in a special "bi-flexing" operation. Company spokesmen point out that this post-gumming treatment contributes to better water penetration and makes the tape lie flatter.

Cracking Film

Essentially, bi-flexing consists of cracking what would otherwise be a glassy film of glue by running the tape over breaker bars. The operation cuts waste due to curling and as a result, firms shipping their products in tape sealed corrugated cartons report savings up to five per cent on tape costs.

Longer fibers in the kraft paper used account for the moldability characteristics of the tape. Made from 60-pound base stock, it has a high tensile strength which enables it to stand up under the stressing of the breaker bars during the bi-flexing operation.



Glassy film underside of gummed tape is cracked by running the paper over breaker bars in a special bi-flexing operation at the Atlantic plant.

Undesirable Bolted Construction Avoided in Production of Portable Military Shelters by

Epoxy Bonding Aluminum Components

By NEIL KVASNAK

Craig Systems, Inc.,
Lawrence, Mass.

The recasting of U.S. Army divisions from three regiments into five battle groups brought with it a demand for easily transportable message centers and sub-centers for use in a redesigned system of battle communications. Several years of testing and development have recently led to the perfection of a shelter which basically consists of two high-strength, heat-treated aluminum skins which are epoxy bonded to extruded aluminum framing members.

Called "Helicop-Huts," the air transportable shelters are used for the housing and protection of electronic systems during operation, transit and storage. They were pioneered by Craig Systems, Inc., and provide load-carrying characteristics with as high as a 15 to 1 payload/weight ratio.

Conventional Construction

Until about ten years ago, most mobile shelters employed conventional construction, *i.e.*, structural framework, an outer metallic skin, usually glass fiber insulation, and an inner skin of plywood or pressed board. In the main, all of these shelters were quite cumbersome and not at all suitable for transport by air.

In addition, before the switch to using structural adhesives, bolted constructions proved undesirable for mobile military use since the bolts always required clearance holes. Under the stress of field use the bolts would work loose and water leaked into the shelter with subsequent damage to installed equipment. Riveted and welded constructions also proved impractical because shelters made in this manner were still too heavy for rapid transportation by air.

The new shelters are basically sandwich-type constructions and weigh about two-thirds less than comparable previous units. In them, the space between the inner and outer aluminum skins is filled with a light-weight, foamed-in-place isocyanate core.

In addition to its inherent toughness and resistance to chemicals and weathering, adhesive bonding was selected for joining the skins and framing members because it made possible shelters of high temper aluminum alloy, 6061-T6. This thin, high-strength aluminum could not be used on previous shelters because welding heat inevitably annealed the metal.

The completely contained communications center can be easily transported to new positions. Flat helicopter drops up to two feet can be made without damage to the shelter or equipment. New units weigh two-thirds less than previous ones.

Curing Epoxy Adhesives

Epoxy adhesives can be cured at room temperature or low heat and therefore do not affect the temper of the aluminum. During the course of research and development studies, tensile shear tests (in accordance with MIL-A-5090A) showed that the bond strength available with epoxy adhesives was 80 per cent greater than the minimum specified by the government.

The adhesive used is based on Shell Chemical Corp.'s Epon resins

and is produced by Lawrence Adhesive and Chemical Co., Lawrence, Mass. It is a thixotropic (non-sagging) metal-to-metal bonding agent supplied as a two-component system involving a resin and a curing agent.

As has been pointed out, framing members for the floor, roof and wall of the shelters are angular aluminum extrusions. Where specified, vertical mounting ribs and other extruded members are inserted between the wall skins to serve as anchoring mediums for the fastening of electronic and other equipment. All of the individual frames and ribs are bonded together with the epoxy. The aluminum skins are then also bonded to the extrusions; once the adhesive has cured, the bond between extrusions and panels is virtually indestructible.

Assembled panels are filled with the isocyanate foam which is capable of transferring some shear between the inner and outer skins by distribution of shear loading. The foam also imparts tensile, shear and compression loading to the vertical members embedded within the core material. Finally, the fire-resistant foam also serves as an excellent insulation medium.

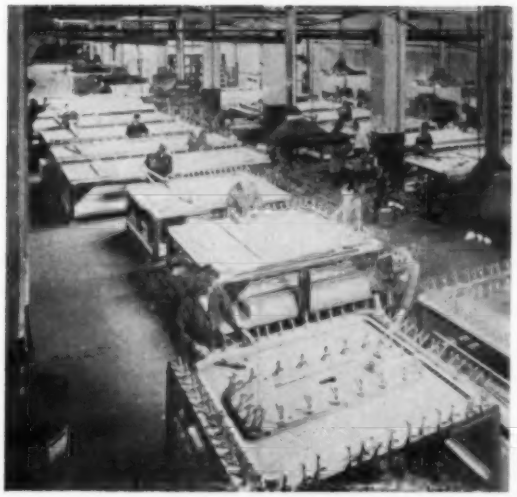
Completed floor, roof and wall panels are bonded together to form the enclosed shelter. For additional weather protection, all exterior seams and joints are filleted with the adhesive.

Enclosures are built in sizes from 4¾′ x 5′ x 6′ up to 6⅓′ x 6⅓′ x 14′, and have an assured service life of five years. Recently, the ruggedness of the foamed-in-place panels and bonded aluminum constructions was graphically illustrated when the shelters passed a grueling battery of tests.

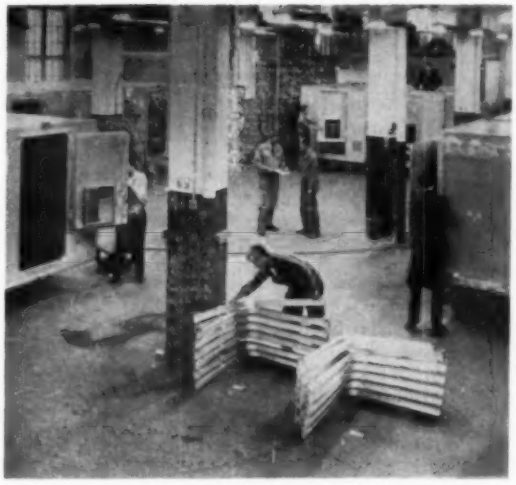
Drop Tests

The S-144 shelter, weighing only 350 pounds, was loaded with 1500 pounds of simulated electronic equipment and dropped ten times from one to ten-foot heights without damage. In actual helicopter transport, flat drops up to two feet were made without deforming the shelter or damaging the equipment.

Equally successful were Helicop-Hut tests for insulation, air tightness, snow load, temperature range, humidity, salt spray, and fording. In the latter test, a shelter loaded with 7000 pounds of simulated equipment, was successfully floated free in water.



At the panel assembly division of the Craig plant, floor and roof panels are formed and wall panels are laid up and bonded with epoxy adhesive.

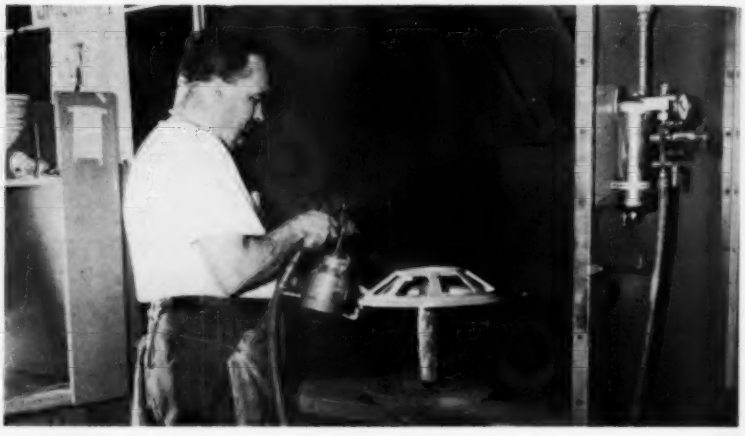


View of the shelter assembly area where finished panels and extrusions are combined to form the completed aluminum communications shelter.

Finished shelters on the Craig assembly line are ready for the installation of racks which will support the communications equipment.

Adhesives Eliminate a Costly Welding Operation

Adhesives between the mating surfaces of assembled metal parts are cured in a forced-convection electric oven.



Adhesive bonded high-fidelity speaker component is given a spray finish at the plant of J. B. Lansing Sound, Inc.

By assembling metal parts with plastic adhesives instead of by conventional welding techniques, a Los Angeles sound equipment company has simultaneously slashed manufacturing costs and improved the quality of its products.

The company is James B. Lansing Sound, Inc., a specialized producer of loudspeakers and speaker systems for the mushrooming high fidelity industry. It uses a high-strength epoxy resin product to mate basic ferrous and nonferrous structural components.

A less-expensive thermoplastic cement is used where high joint strength is non-essential to product quality.

The adhesive technique not only saves money by minimizing defects which necessitate rejects, but also eliminates machine work which would be needed to improve the appearance of joints if welding were done. Simultaneously, product quality is improved because joints comprising dissimilar materials have superior resistance to sound vibrations —the principal stresses imposed on speaker equipment in operation.

Parts to be assembled with the epoxy adhesive, which is obtained in powder form, are separately oven preheated to 500° F. Then, before they can cool to any appreciable extent, the epoxy powder is sprinkled over their mating surfaces. Resultant heating effects liquefy the powder, causing it to penetrate the metal pores of castings in addition to creating smooth adhesive coatings. In the next step, the parts are fixture assembled and returned to the oven for further heating at 500° F. for 45 minutes in order to fuse the coatings on mating surfaces.

The solvent-dispersed thermoplastic cement is used in the assembly of coils, cones, and diaphragms. The latter require no high adhesive joint strength because their eventual alignment is certain to be maintained by powerful permanent magnets. It is applied and dried at room temperature, like ordinary glue or paint. The mating parts are then fixtured so that they will be under pressure, and their adhesive coatings are fused at 400° F. for periods of 8 to 30 minutes—depending on the dimensions of the fixtures used in each instance.

Lansing Sound had trouble assembling metal parts with plastic adhesives when such work was initially done on a large scale. While some components would be properly bonded, other parts would be either undercured or overcured at the end of a given heating cycle—despite the use of identical adhesive media and fixtures with uniform dimensions.

This of course made it necessary to reheat some parts and to reject others—an undesirable production situation, no matter how you consider it.

A subsequent investigation disclosed that the trouble was due to non-uniform temperatures existent in available ovens, and that consistently good joints couldn't be expected where variations from a specified temperature exceeded ±5° F.

To rectify matters, the company proceeded to buy a pair of forced-convection electric ovens with controls and other accessories needed to maintain precision temperatures. One, having a maximum heat output of 650° F., is now used to cure joints with epoxy adhesives; the other, with a maximum output of 500° F. is used where lower curing temperatures are needed.

Because each has a greater heating capacity than that which is actually needed for routine work, the two ovens should require little maintenance over a period of many years. On the other hand, either oven can be used to produce any type of glue joint that may be required when (or if) its mate is inoperative.

Construction-strength sandwich panels from

Adhesive-Spread Honeycomb Core

Various factors have thrown continually greater weight toward wider adoption of adhesive-bonded honeycomb sandwich panels in building construction. Though often employed because of the interesting esthetic effects they make possible, the key to their popularity is the fact that they can be used to make up complete wall and roof sections, eliminating the need for skeletal framework.

Stressed-skin sandwiches have remarkable strength characteristics and high structural integrity. The phenolic-impregnated Kraft honeycomb core used is machined to tolerances on the order of thousandths of an inch thick. This honeycomb is then laminated with metal faces under the application of heat and pressure to form a one-piece construction with absolute dimensional stability and remarkable torsional rigidity. Not only are the resulting panels inherently insulated because of their excellent thermal properties, but their low weight and the special structural interlock joints employed, allow the development of clear long spans which greatly exceed those possible with reinforced concrete.

Though various types of adhesives are used in sandwich constructions, it is probable that the most suitable are of the neoprene rubber type. This is because of the latter's excellent adhesion to metal facings and honeycomb core. However, no matter what type of adhesive is employed, it must have sufficient strength to resist stresses to be met.

For example, it has been found that under the most adverse conditions, during the hottest part of the year, the temperature in the exterior face of such panels may build up to approximately 180°F. In consequence, any adhesive used must show good heat resistance up to that point and beyond.

The adhesive application method employed by Panelfab Products, North Miami, Fla., is in many ways typical of the technique used by leading manufacturers of these building components. It involves spreading the glue with roller type machines which coat both sides of the honeycomb at a single pass.

Spreaders of this kind, such as the one made by Black Brothers Co., Inc., Mendota, Ill., now include models suitable for use in spreading rubber-based adhesives. A series of solvent drippers is incorporated so that the solvent can be sensitively added to the glue in the roll crotch reservoirs, and compensate for that which is lost through evaporation. In addition, a hood over the spreader confines the solvent vapors and reduces the rate of evaporation.

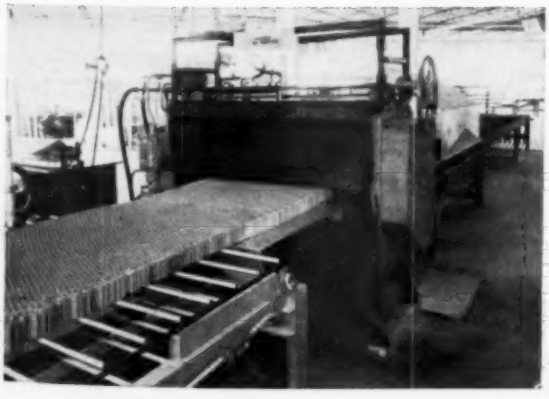
As the honeycomb material emerges from the spreader, a conveyor carries it beneath an exhaust hood and stack. Here, the major part of the solvent fumes are exhausted and the adhesive approaches the tacky condition desirable for the application of the metal faces.

Spreaders used at Panelfab feature a dial indicator which shows the precise distance, in terms of thousandths of an inch, of the space between applicator rolls. These units are extremely convenient for keeping a record of roll adjustments made for any particular job. Should it be necessary to make an additional run, the rolls can be quickly returned to the exact position required.

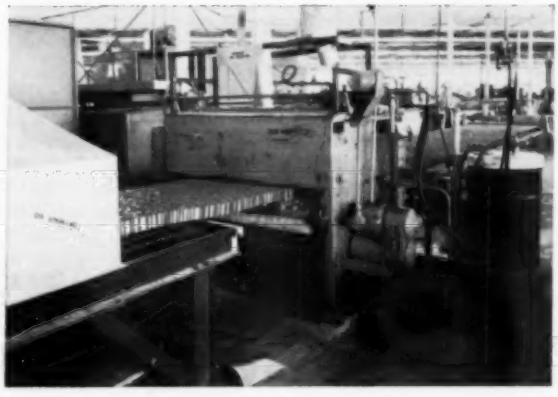
The extremely favorable weight-strength ratio obtained in such panels and components is largely due to the use of honeycomb core. Depending upon the product in which it is used, such core may be made from metal foil strips, cotton or glass fiber. The great preponderance of honeycomb core, however, is an expanded form of cellular paper construction. Generally, the paper is impregnated with phenolic resin, and has been formed into hexagonal cells resembling the bee structures which give it its name.

By changing the size of the cell, by using different material, and by varying the amount of resin impregnated, widely different physical properties are obtained. Surprisingly light panels can be designed without any sacrifice of over-all structural strength.

Infeed view of 50-inch hooded glue spreader used at the Panelfab plant to simultaneously coat the top and bottom of honeycomb core.



The honeycomb material emerges from the spreader onto a conveyor which carries it beneath an exhaust hood and stack, extreme left.



NEWS of the ADHESIVES WORLD

Symposium on Industrial Adhesives Planned at University of Wisconsin

Engineering Institutes, in cooperation with the Glues and Gluing Division of Forest Products Research Society and the Forest Products Laboratory, has announced that its program on Industrial Adhesives Applications will be held on October 1 and 2 at the University of Wisconsin, Madison, Wisc. According to Engineering Institutes, companies using or considering using adhesives in the bonding of wood, metal or plastic will find in this institute solutions to problems encountered in design and fabrication with adhesives, trouble shooting adhesive bonds, and future uses for adhesives to improve product quality or reduce product costs. The meeting will be held in the new Wisconsin Center Building on the main campus of the university.

Richard F. Blomquist, supervisory chemist, U.S. Forest Products Laboratory, will preside over the two day meeting. Outstanding speakers from industry and the Forest Products Laboratory will present the most progressive and important views on industrial adhesives application. The following topics are included in the tentative program: Designing With Adhesives; Adhesives in the Wood and Paper Industries: Plywood, Laminated Timbers, Adhesives in the Housing Industry, Particle Board Binders, and Paper and Fiberboard Adhesive Application; Panel Discussion on Adhesives in the Wood and Paper Industries; Adhesive Fabrication of Metals and Plastics: Adhesive Producers' Viewpoint, Adhesive Users' Problems; Panel Discussion on Adhesive Fabrication of Metals and Plastics; Problems in Adhesive Bonding: Production Planning, Production Control, and Quality Control; Future Uses of Adhesives in the Metals and Plastics Industry; New Glued Wood Products; and Trouble Shooting Adhesive Bonds

Additional information concerning the Industrial Adhesives Institute can be obtained from Richard A. McCormick, Institute Coordinator, 4016 Stadium, University of Wisconsin, Madison, Wisc.

Packaging Competition

The National Flexible Packaging Association, Cleveland, Ohio, has announced plans for the Fourth National Flexible Packaging Competition. Approximately 100 awards are anticipated including up to five new awards for breakthrough ideas which apply converted flexible packaging to new uses or which demonstrate marked improvements in converting skills. Converted flexible packages produced by NFPA member companies are eligible for the competition. Both construction and material categories as well as major end uses will be rated separately. The award announcements will be made at the NFPA Fall Meeting on October 26 at the Greenbrier in White Sulphur Springs, West Va.

Prize Cartons on Tour

The Folding Paper Box Association of America, Chicago, Ill., has announced that nearly 4,400 packaging decision-makers and other interested persons viewed the award winning boxes of the 1959 national folding carton competition in a two month, coast-to-coast tour of 20 major cities. Following an initial public exhibit in Chicago, Ill., the "100 best cartons of the year" were displayed at luncheon and dinner meetings of advertising and sales executives clubs in Minneapolis, Minn.; Philadelphia, Penna.; New York, N.Y.; San Francisco, Calif.; Washington, D.C.; Denver, Colo.; Memphis, Tenn.; St. Louis, Mo.; New Orleans, La.; Rochester, N.Y.; Indianapolis, Ind.; Detroit, Mich.; Boston, Mass.; Atlanta, Ga.; Dallas, Texas; Los Angeles, Calif.; Miami, Fla.; Houston, Texas; and Seattle, Wash. The association reports that an additional showing will be held this fall in Cleveland, Ohio, in cooperation with the Advertising Club of Cleveland.

Venezuelan Resin Firm

Reichhold Chemicals, Inc., White Plains, N. Y., has formed a new company called Resinas Venezolanas, C. A. in Caracas, Venezuela, for the production of synthetic resins. The new firm, formed with a group of Venezuelan industrialists, will use formulas and techniques developed by Reichhold. Biggest consumers of the resins are expected to be the surface coating, adhesives, polyester and plastics industries of Venezuela.

Latex for Coatings

Plastics Division of Koppers Co., Inc., Pittsburgh, Penna., has announced the development of a new latex for pigmented paper coatings which is reported to have greater adhesive strength and less foam. Koppers reports that the new latex, known as Dylex Latex KCD-154, has as much as 50 per cent increased film strength, which results in better pigment binding and increased pick resistance of the coated sheet.

Improvements over conventional styrene-butadiene latices have been obtained by carefully adjusting the emulsifier content and by fortifying the polymer during polymerization, the company states.

According to the company, experimental work indicates that use of this new latex increased pick resistance at all adhesive levels checked, whether it was in combination with starch or casein. In addition, foaming tendencies are reported to be considerably decreased. There is less foam formed initially during agitation with other coating ingredients, and this minimal foam dissipates at a much more rapid rate than in conventional latex, the company states.

Compatibility with various clays and pigments as well as with starch and casein, is reported to be excellent.

Service Department

Resin Research Laboratories, Inc., Newark, N.J., has established a new Technical Service Department to provide a fully-equipped laboratory with complete staff for technical service requirements in the local area. According to the company, manufacturers of materials currently being used or materials which may have future import in the resin and polymer fields and their multiple applications may now take advantage of the facilities and staff of Resin Research Laboratories to function as their technical service laboratory.

3M Plans Plant

Minnesota Mining and Manufacturing Co., St. Paul, Minn., has announced that it is going to build a $4.5 million fluorochemical plant at Decatur, Ala. The plant, scheduled for completion in early 1961, will be chiefly used to produce fluorochemicals, but will also make specialty and modified chemicals for the firm's own use.

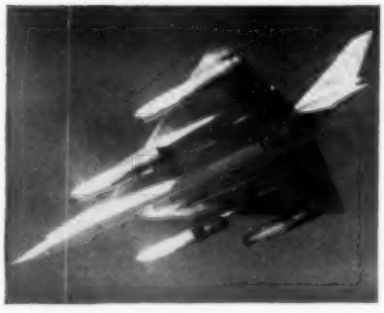
B.F.Goodrich

Over 200 kinds of adhesives

TODAY, B.F.Goodrich makes over 200 kinds of adhesives. Most of these are in regular use in one or more of our customers' plants. Some are tailored to specific jobs, others cover a range of many applications.

Adhesives made by B.F.Goodrich will bond almost any materials you can name—joining them to themselves or each other. Sometimes, adhesive bonding is the only practical method of fastening. In other cases, adhesives often have special advantages—high strength, less weight, lower cost or greater freedom of design.

Brake linings, supersonic planes, helicopter rotor blades, curtain walls for buildings, for example, have all proven to be stronger, safer when bonded together with B.F.Goodrich adhesives. High-strength adhesives took the place of 500,000 rivets in the B-58 supersonic bomber (picture).



Each month, perhaps a dozen new formulations join the ranks of our adhesives as we work with industry to find ways to improve product design and production techniques. Here are some recent examples:

B.F.Goodrich has perfected an adhesive that permits vinyl-coated sheet steel to be deep-drawn—stretched as much as 35 per cent without weakening the bond or damaging the coating.

Two new adhesives have been developed by B.F.Goodrich for bonding polystyrene foam. One is ideal for use with foamed-in place polystyrene. The other is recommended for bonding pre-foamed polystyrene shapes to themselves or to steel, aluminum, formica and other materials.

For bonding some materials that in the past stubbornly refused to stick together, B.F.Goodrich has a new group of rubber-like adhesives. Synthetic films, such as nylon, polyethylene and cellophane can now be bonded to all kinds of metal as well as to paper, wood, glass, foils and plastics.

With so many stock adhesives to choose from, and so many other special ones possible, it may be a problem to find the best one. You can get more information by writing to B.F.Goodrich.

When you write, give details. It's surprising how often small details help us recommend the one adhesive that does the job.

How will you apply the adhesive? Spray, roller coat, extrusion or brush? What materials are to be joined? Can heat and pressure be used? Any temperature limitations? Method of assembly (present or proposed)? Is metal used? If so, how is the metal pretreated?

How strong must the bond be? Must it have heat resistance? How much? Chemical resistance? Are there any requirements for taste, odor, toxicity, color? Any other requirements?

Just write to *Department M-685, B.F.Goodrich Industrial Products Co., Akron 18, Ohio.*

B.F.Goodrich ***industrial adhesives***

Officers of the newly-formed Roberts Chemical Co. They are: seated, Wallace Taylor, vice-president; standing, left to right, C. E. Hopping, vice-president; K. M. Bishop, secretary-treasurer; Gerald DeBeau, vice-president; Hugh S. Livie, president; and V. W. Clark, executive vice-president.

Roberts Chemical Company Formed

The Roberts Co., City of Industry, Calif., has announced the formation of the Roberts Chemical Co., with the acquisition of the Anchor Chemical Co. A pioneer in the floor covering installation product field, the Roberts firm recently expanded into the hardware and building supply industry and now broadens its product line with adhesive bonding materials. Anchor Chemical plants are located in El Monte, Calif., and Dayton, Ohio. The Dayton plant will continue operations, while the El Monte facilities will be brought into the new 65,000 square foot plant addition of the Roberts site at City of Industry.

Engineering Show

The Production Engineering Show will be held on September 6-16 at Navy Pier, Chicago, Ill., running concurrently with the Machine Tool Exposition which will take place at the International Amphitheatre in Chicago on the same dates. More than 125,000 production executives from every country of the world are expected to attend the engineering show, which will be the only exhibit of products which supports prime production tools. These include mechanisms, instruments and equipment which contribute to greater production efficiency of machine tools. On exhibit will be control equipment; machine components; inspection, gauging and testing equipment; materials handling equipment; safety equipment; intraplant communications, and special production equipment. Both events will be managed by Clapp & Poliak, Inc., New York, N. Y.

Danish Plant On Stream

Schenectady Varnish Co., Inc., Schenectady, N. Y., and A/S Danske Oliemoller O G Saebefabrikker, Copenhagen, Denmark, have jointly announced that full commercial production of polyester and alkyd resins has begun at their newly erected facilities in Copenhagen. According to the announcement, this is the first production of these resins in Denmark, the country's requirements previously being imported from other European countries.

Form Leon Chemical Firm

Leon Chemical Industries, Inc., Detroit, Mich., is a new corporation formed by Arthur S. Nicholas and Robert Cox, for the production of acrylic coatings for glass and metals, paint intermediates and formulated epoxy. Mr. Nicholas has been named president of the firm.

Packaging for Epoxy

Howe & French Inc., East Weymouth, Mass., has developed containers designed for safe shipping plus convenience and economy of on-the-job application for its two floor surfacing and patching compounds, H-F Epoxy-Crete and H-F Epoxy-Tred. The containers are three component units in heavy reinforced cylinders, each product in two sizes for large and small applications. Epoxy resins and hardening agents are packed in the cylinder with special kiln dried sand or abrasive in correct proportions for mixing.

H-F Epoxy-Crete is packaged in 24 and 96 pound units, sufficient to cover 9 and 36 square feet of floor respectively with a surface one-quarter inch thick, and H-F Epoxy-Tred, a special skid proof surfacing compound, is packaged in 8½ and 35 pound containers for 50 and 200 square foot areas, the company states. According to Howe & French, these epoxy-based compounds bond permanently with virtually all common flooring materials, forming a surface of tremendous strength that resists impact, vibration, heavy usage and erosion.

Epoxy Surface Coating

Emerson & Cuming, Inc., Canton, Mass., has developed a surface coating that can be used continuously at 500°F. and for short periods up to 600°F. According to the company, the surface resistivity of the epoxy coating, called Eccocoat C26, is above 10^{15} ohms at room temperature and remains at approximately 10^{14} ohms, even at 500°F. The company reports that adhesion to a wide variety of materials is good. Eccocoat C26 is recommended for use in coating printed circuit boards, electronic circuits and components, metals and ceramics.

Buys Corrugated Stock

Western Kraft Corp., Portland, Ore., has announced that it will purchase the remaining stock of Western Corrugated, Inc., for an undisclosed amount of money. Western Kraft currently owns about 55 per cent of Western Corrugated stock. Under the terms of the merger, Western Corrugated will become an operating division of Western Kraft.

Borden Appoints Stull

A. N. Stull has been appointed assistant vice-president for technical services of the Borden Chemical Co. Mr. Stull, formerly general manager of Borden's Coatings and Adhesives Department, moves his headquarters from Peabody, Mass., to North Andover, Mass., where the company has its Resinite vinyl extrusion plant.

The company also announced that Henry L. Schmidt, formerly operations manager of its five Resins and Chemicals Department plants and laboratories, has been named to succeed Mr. Stull as general manager of the Coatings and Adhesives Department.

Mr. Stull graduated from Georgia Institute of Technology in 1937, and received an M.A. degree from Columbia University in 1941. He formerly was president of American Polymer Corp., Synco Resins, Inc., and American Resinous Chemicals (Canada) Ltd. He joined Borden in 1955, when the company acquired American Resinous.

Mr. Schmidt graduated from the University of Michigan in 1944, and obtained his M.A. degree in 1948. He joined Borden in 1953 as chief production engineer of its Bainbridge, N.Y., resins and chemicals plant, became manager of the plant and later manager of the company's Northeast district. Prior to joining Borden, he was technical director of Haviland Products Co.

Ciba Plans Unit

Ciba Products Corp. has announced that it is building a new plant at Toms River, N.J., which will produce epichlorohydrin, the basic raw material used in the production of epoxy resins. According to the company, the output of the new plant will be used solely for its own manufacturing operations. The plant, due for completion in June, 1960, will be the most modern epichlorohydrin plant in the world and will feature unique quality control equipment, the company states.

Furane Names Heath

Furane Plastics, Inc., Los Angeles, Calif., has named Arthur N. Heath manager of its Building Trades Division. Mr. Heath, a graduate of the University of California, and formerly chief chemist of Electrofilm, Inc., will supervise the sales and development activities of the Building Trades Division.

COLTON—pioneer source of polymer resins—has the raw materials you need for your products

Formulations are easier . . . costs are less . . . your products are 'beefed up' with sales-making features when you use the wide variety of *Colton chemicals for the adhesives-industry*, shown in the condensed table below.

Colton adhesive specialists will gladly furnish you with samples and technical data and make recommendations for your particular problem. Write Dept. B-24

PRODUCTS	APPLICATIONS
POLYVINYL ALCOHOL	Ten grades available. Formulates high quality emulsion glues or as emulsifiers and thickeners.
POLYVINYL ACETATE EMULSIONS	A full range of emulsions for strong, quick-setting adhesives for wood, paper, leather, cloth or plastics.
POLYVINYL ACETATE BEADS (Resin in Solid Form)	For formulating immediate-tack adhesives, hot melts, heat seals. Alkali-soluble grade available.
COPOLYMER VINYL ACETATE-VINYL STEARATE BEADS	*New development products.* As bases or modifiers for paper adhesives and coatings; leather finishes and adhesives. Non-toxic, grease-resistant.
COPOLYMER VINYL ACETATE-VINYL STEARATE EMULSIONS	

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Sales Offices and Warehouse Facilities Throughout U. S. • Export: Airco Company International, New York 17, N. Y.

Named Manager

Edward G. Schwaegerle has been named manager of synthetic resin development at the Avon Lake, Ohio, Development Center of B. F. Goodrich Chemical Co., Cleveland, Ohio, a division of B. F. Goodrich Co., Akron, Ohio. He formerly was development supervisor in charge of vinyl resin development. Mr. Schwaegerle graduated from the University of Cincinnati in 1942 with a B.S. degree in chemical engineering, and joined B. F. Goodrich the same year as a junior chemical engineer in the process control laboratory in Akron.

In 1943, Mr. Schwaegerle was transferred to a newly organized vinyl resin development group, and moved to Avon Lake when Goodrich Chemical began operations there. He became a technical man in 1946 and continued to work in polymerization development. In 1952, he was named senior technical man and that same year was named development supervisor of the group which has developed most of the vinyl resins now sold by the chemical firm. Mr. Schwaegerle is a member of the American Institute of Chemical Engineers and the American Chemical Society.

Chemical Exposition

New developments in continuous process analysis and control will be one of the features of the 27th Exposition of Chemical Industries, to be held at the New York Coliseum, November 30 to December 4. It has been reported that exhibits of new instruments and controls will form one segment of a display which includes the basic chemical materials, inert substances, rare, as well as common metals, and the ever growing list of man-made structurals and intermediates—glass, ceramics, plastics, and the combination of synthetics with natural materials.

Terhune Appointed

Francis L. Terhune has been appointed assistant development manager at the Resinite Department plant of the Borden Chemical Co. in North Andover, Mass. Mr. Terhune graduated from Western Illinois State University in 1950 with a B.S. degree in chemistry. He joined Borden as a chemist in 1956, when the company acquired Resin Industries of Santa Barbara, Calif.

John W. Bruce

Barrett Names Manager

Barrett Division of the Allied Chemical Corp., New York, N.Y., has announced that John W. Bruce Jr., has been named marketing manager for protective products and adhesives. Mr. Bruce attended Polytechnic Institute of Brooklyn and Temple University. He previously was with the Industrial Tape Corp. Prior to joining Barrett, Mr. Bruce was sales manager for Rubber and Asbestos Corp. He is a member of the Society for the Plastics Industries, the American Society for Testing Materials and the Building Research Institute.

Elected President

Frederick S. Leinbach has been elected president of Reigel Paper Corp., New York, N.Y. John L. Reigel, who has been serving as chairman of the board and president, will continue as chairman of the company. Mr. Leinbach joined the Reigel organization in 1934, starting as a chemical engineer for product development at the company's mill in Milford, N.J. He has been executive vice-president of the corporation since 1957. Mr. Leinbach is a member of the board of governors of the American Paper & Pulp Association, chairman of the Chemical Additives Committee and the Glassine & Greaseproof Association. He has served as president of the Packaging Institute and, during World War II, was assistant director of the Container Division of the War Production Board.

Licenses Ford Motor

U. S. Rubber Co., New York, N. Y., has licensed the Ford Motor Co. to use a method for continuously laminating decorative and durable vinyl plastic sheet to metal, which was developed in 1953 by the Naugatuck Chemical Division. According to U. S. Rubber, Ford will be the first automotive company to be licensed to use the laminating technique, called the Marvibond process, and will also be the first licensee of the process that makes both its own vinyl plastic film and steel.

Vinyl film for laminate use will be made in the Ford Motor chemical products plant in Mt. Clemens, Mich. Essentially, the laminating process is a method for continuously bonding metal with semi-rigid plastic sheet to give the metal an attractive and durable finish before it is formed. Then it can be shaped and fabricated with virtually any metal-working technique, including spot-welding, without damaging the plastic facing. The process has now been licensed to 17 American manufacturers, including major steel companies, and in 27 foreign countries.

International Director

General Mills, Minneapolis, Minn., has announced that Edwin W. Rawlings, financial vice-president, has been assigned additional duties as director of international activities for the company. The company also announced that H. M. Joslin, who has served as administrative assistant to the executive vice-president in charge of mechanical and chemical activities, has been named deputy director of international activities. Under his new responsibility, Mr. Rawlings will coordinate all the international activities of the corporation and will serve as a point of clearance for all services on international matters provided to operating divisions by staff departments, the company states.

New Epoxy Resins Plant

Union Carbide Plastics Co. has completed a liquid epoxy resins plant at Marietta, Ohio, having a 15 million pound annual capacity. The product will be used in protective coatings, reinforced plastics, laminating materials, adhesives and similar materials.

14th TAPPI Conference Features Panel Talk

A highlight of the 14th TAPPI Plastics-Paper Conference, to be held on September 21 to 23 at the Edgewater Beach Hotel, Chicago, Ill., will be a panel discussion of the new Food Additives Amendment to the Federal Food, Drug, and Cosmetic Act. Panelists will represent various sectors of the packaging industry affected by the amendment.

A tentative technical program has been scheduled for the three day conference. The first session, scheduled for Monday, September 21, will be chaired by Clifford Sutton (General Foods). Among the papers to be presented will be: "Water Vapor Transmission Through Permeable Membranes", and "Mechanism of Gas Transmission Through Permeable Membranes", both by V. T. Stannett (College of Forestry). The second paper will be a summary report of a TAPPI-sponsored research project. Other papers will deal with new technical developments in the paper-plastic coating industry.

J. V. Eller (H. P. Smith Paper) will serve as chairman of the second session, on Monday afternoon, which will be devoted to a panel discussion on the present and future for waxed, saturated, asphalt laminated, abrasive, plastic coated, and gummed papers. This will be a semi-technical, semi-marketing session on the present status of each product and its prospects through 1965. Competitive factors will be included. Speakers will be announced at a future date.

L. C. Hanson (Continental Can) will speak at the banquet which will be held on Monday evening. The third session, scheduled for Tuesday, September 22, will be chaired by C. M. Fields (Continental Can). Papers will include "The Problem of Odor in Polyethylene-Laminated Structures", by P. H. Strome (Continental Can); "Polyethylene Film in the Extrusion Coating Market", by E. H. Myers, (Monsanto Chemical); "New Extrusion Techniques", by a speaker to be announced later; "Performance of Automatic Packaging Machines with Paper-Plastics Products", by F. J. Sloan (packaging consultant).

A panel discussion of the Food Additives Amendment to the Food, Drug, and Cosmetic Act will be held at the fourth session, during which W. B. Tibbets (Union Carbide Plastics) will serve as chairman. The government story will be presented by a speaker to be announced at a later date. The paper industry story will be presented by R. Wilcox (Marathon). The plastics industry story will be discussed by E. Balestier (Visking). G. Lacey (Dobeckmun) will speak on the converters' story, while C. M. Woodcock (General Foods) will discuss the users' story.

The fifth session, to be held on Wednesday, September 23, will be chaired by H. A. Spencer (Knowlton Bros.). Papers scheduled for this session are "Effect of Volatile Content and Moisture on Electrical Properties of Phenolic Resin Paper Laminates", by M. Ezrin (Monsanto Chemical); "Report on Project No. 763, Test for Rate of Resin Penetration", by D. Gilmore (Brown); "Report on Project No. 764, Resin Solids Test", by C. A. Siconolfi (Durez); and "Water Immersion of Resin Saturated Papers", by F. Rosenthal (Knowlton Bros.).

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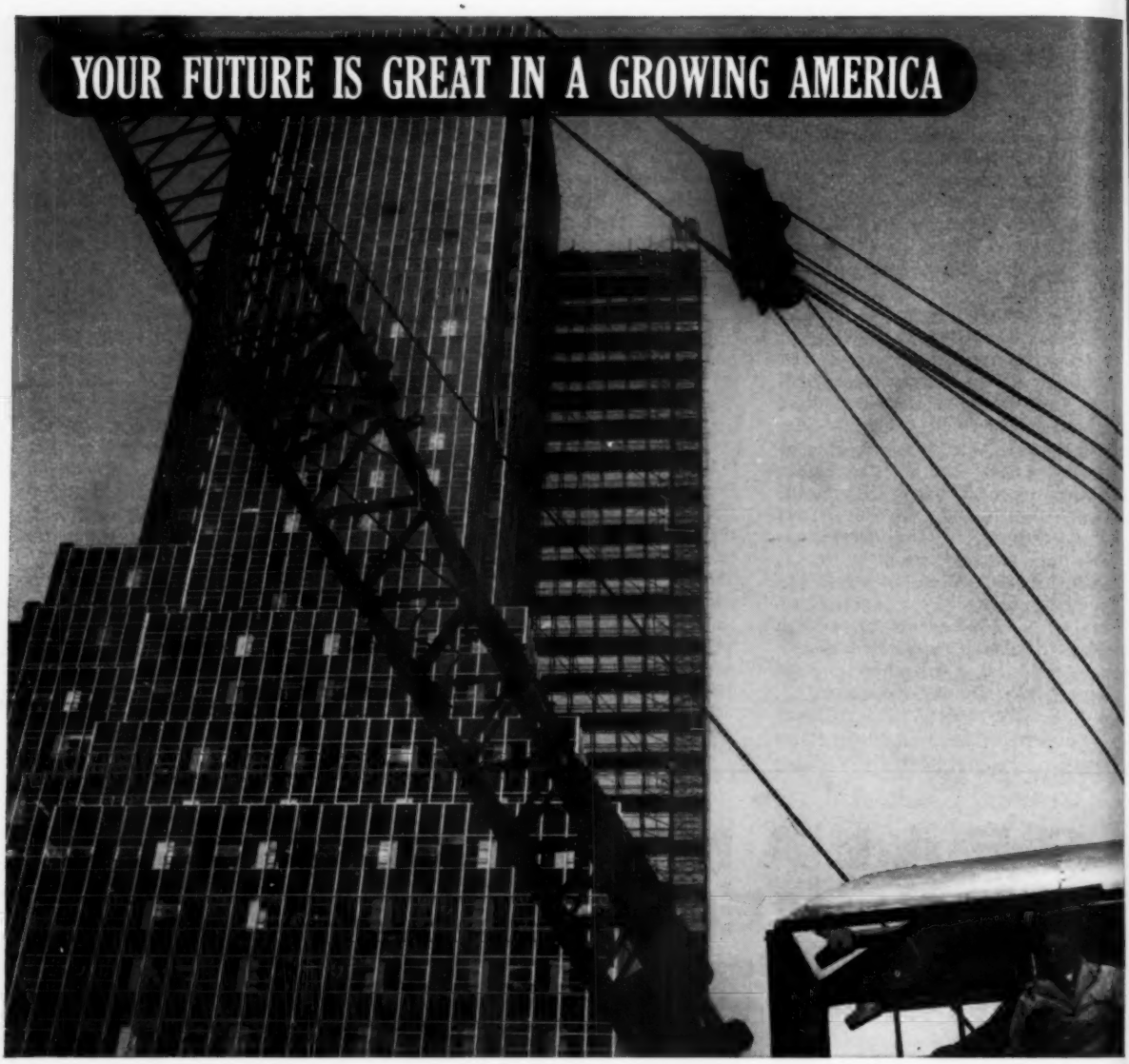

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Aug. 31-Sept. 4. Gordon Research Conference, Chemistry of Adhesion, New Hampton School, New Hampton, N.H.

Sept. 9-11. TAPPI Symposium on the Fundamentals of Fiber Attraction and Bonding, Institute of Paper Chemistry, Appleton, Wisc.

Sept. 10-11. ASME Wood Industries Conference, Multnomah Hotel, Portland, Ore.

Sept. 21-23. TAPPI 14th Plastics-Paper Conference, Edgewater Beach Hotel, Chicago, Ill.

Sept. 21-25. 14th Annual Instrument Automation Conference and Exhibit, International Amphitheater, Chicago, Ill.

Sept. 21-25. 1959 Congress on the International Council for Building Research, Studies and Documentation, Rotterdam, Holland.

Sept. 27-29. National Fibre Can & Tube Assn., Semi-Annual Meeting, The Broadmoor, Colorado Springs, Colo.

Sept. 27-30. American Institute of Chemical Engineers, St. Paul, Minn.

Sept. 28-30. American Oil Chemists' Society, Hotel Statler, Los Angeles, Calif.

Sept. 28-Oct. 2. 14th Annual Hardware Show, New York Coliseum, New York, N.Y.

Oct. 1-2. Engineering Institutes Industrial Adhesives Applications Symposium, University of Wisconsin, Madison, Wisc.

Oct. 5-6. Conference on Packaging Specifications, Purdue University, Lafayette, Ind.

Oct. 6-8. National Hardwood Lumber Association, Queen Elizabeth Hotel, Montreal, Canada.

Oct. 6-9. 2nd International Symposium on "High Temperature Technology" sponsored by Stanford Research Institute, Asilomar, Calif.

Oct. 7. Society of Plastics Engineers, Cleveland Section, Cleveland, Ohio.

Oct. 11-16. ASTM 3rd Pacific Area National Meeting, Sheraton-Palace Hotel, San Francisco, Calif.

Oct. 13-14. National Technical Conference, Society of Plastics Engineers, Ambassador Hotel, Los Angeles, Calif.

Oct. 18-22. The Electrochemical Society, Inc., Deshler-Hilton Hotel, Columbus, Ohio.

Oct. 19-21. National Paint, Varnish & Lacquer Association, Chalfonte-Haddon Hall, Atlantic City, N.J.

Oct. 19-23. 47th National Safety Congress and Exposition, Conrad Hilton Hotel, Chicago, Ill.

Oct. 20-24. 24th Paint Industries' Show, Convention Hall, Atlantic City, N.J.

Nov. 5-6. ASTM, Committee D-14 on Adhesives, Case Institute of Technology, Cleveland, Ohio.

Nov. 12-14. National Association of Lumber Manufacturers, Annual Meeting, Washington, D.C.

Nov. 16-19. Building Research Institute, Fall Conferences, Shoreham Hotel, Washington, D.C.

Nov. 30-Dec. 4. 27th Exposition of Chemical Industries, New York Coliseum, New York, N.Y.

Jan. 12-15, 1960. 16th Annual Technical Conference, Society of Plastics Engineers, Conrad Hilton Hotel, Chicago, Ill.

Jan. 26-27, 1960. Society of Vacuum Coaters, Technical Conference, New York, N.Y.

Frick Honored

Dutch Brand Division of Johns-Manville Corp. honored Dr. Carl E. Frick, who retired after 36 years with the company, at a testimonial dinner on June 25, at the South Shore View Hotel in Chicago, Ill. Dr. Frick, formerly technical manager of the Dutch Brand Division, graduated from the University of Akron, obtained his masters degree at Ohio State University, and received his doctorate from the University of Wisconsin. He spent the early years of his career teaching chemistry at Ohio State University, the University of Wisconsin and Case Institute of Technology.

Dr. Frick joined Dutch Brand in 1923 as chief research chemist. At that time Dutch Brand products were manufactured by Van Cleef Bros. In 1947, when the Van Cleef firm was acquired by Johns-Manville, Dr. Frick was named plant manager. He was appointed technical manager of the Dutch Brand Division in 1958.

He is a member of the Chicago Chemists Club; Sigma XI, honorary science fraternity; and Phi Lamda Upsilon, honorary chemistry fraternity.

Repairs Fractured Bone

The United States Army now has an experimental adhesive which was designed to repair broken bones. This substance, the Army states, could prove to be vitally important to ground forces because 60 per cent of combat casualties are bone fractures. The adhesive, a polyurethane polymer, is a foam that is said to bind broken bones together until bone cells grow through the substance. The foam solidifies into a rigid substance when applied to a fracture. Natural bone would eventually replace the plastic.

Wheat Flour Adhesives

Chemists at the United States Department of Agriculture have modified wheat flour into products which may be used as thickening agents, adhesives, and coatings and sizes for paper and textiles. When treated with either ethylene oxide or propylene oxide, flour is said to mix readily with water to form a free-flowing paste. According to USDA, treated flours can be stored satisfactorily at a moisture content of 5 per cent or less.

Armour Names Haughn

J. E. Haughn has been named sales representative for the Armour Industrial Chemical Co., with headquarters at Houston, Texas. Mr. Haugn succeeds J. P. Badman, who recently was named manager of highway construction chemicals. Mr. Haughn has been with Armour since 1957, beginning in the Market Development Department. He later transferred to the Derivatives Department as a petroleum specialist. In his new post, Mr. Haughn will be responsible for sales of Armour aliphatic organic chemicals in Louisiana and the eastern part of Texas.

Scott Promoted

Pittsburgh Coke & Chemical Co., Pittsburgh, Penna., has announced that Richard R. Scott has been promoted to assistant sales manager for its Green Bag Cement Division. Mr. Scott graduated from Washington and Jefferson College in 1948, and then was associated with the National Cash Register Co. In 1950 he joined Pittsburgh Coke as assistant to the general manager, sales, and became a sales representative of the Cement Division in 1954.

Appoints Researchers

Borden Chemical Co., New York, N.Y., has appointed four researchers to its Central Research Laboratory in Philadelphia, Penna., including N.M. Ingber, Dr. Erwin A. Hoess, John H. Merriam and Ray V. Mihailovich. Mr. Ingber, a graduate from the University of Maryland, joined Borden after serving seven years as an analytical chemist with the U.S. Naval Engineering Experiment Station, the Argonne National Laboratory, and the U.S. Army Chemical Center.

Dr. Hoess received his Ph.D. from the University of Vienna. He formerly was with the Food Machinery Co., and has had extensive experience in research on coal products, wood hydrolysis, rubber, organic chemicals and monomers. Mr. Merriam is a graduate of Rensselaer Polytechnic Institute. He formerly was with Allied Chemical Corp. as supervisor in pilot plant operation, project evaluation and process design.

Mr. Mihailovich is a graduate of the University of Pittsburgh. He previously was with the B. F. Goodrich Research Center.

Microwave Absorber

Emerson & Cuming, Inc., Canton, Mass., has developed a microwave absorber known as Eccosorb CV. According to the company, this is the first production microwave absorber guaranteed at a minus 40db reflectivity level for the appropriate frequency band. The material is currently available in six and nine inch thicknesses, designated Eccosorb CV-6 and CV-9. This material is supplied as a lightweight, flexible, fire-retardant foam product, and is manufactured from polyurethane resins, the company states.

NAFM Convention

The National Association of Furniture Manufacturers, Chicago, Ill., has announced that its 31st Annual Convention will be held on August 29 to September 1, at the Conrad Hilton Hotel in Chicago, Ill. The convention will coincide with the NAFM Fifth Annual Supply, Equipment and Fabric Fair. Over 2,000 furniture manufacturers are expected to attend the combined convention and fair to examine the products and services of some 125 exhibitors.

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3M Record Sales

Minnesota Mining and Manufacturing Co., St. Paul, Minn., has reported that both its sales and earnings for the second quarter ended June 30 were the highest ever recorded, surpassing the previous highs set during the fourth quarter of 1958 when sales were $104,926,615, and earnings were $14,100,953, or 83¢ per share. Second quarter sales for 1959 totaled $108,339,894, and earnings were $14,246,327, or 84¢ per share of common stock. For the same period of 1958, sales were $91,054,230, with earnings of $9,747,291, or 58¢ per share of common stock. For the six months ended June 30, 3M sales totaled $210,701,892, compared with $176,261,592 for the same period a year ago. First half earnings were $27,437,746, or $1.62 per share, compared with $17,646,665, or $1.05 per share in 1958.

Sales and Earnings Tops

General Mills, Minneapolis, Minn., has reported that sales and earnings for the year ended May 31 were the best in its history. Sales for the 1958-59 fiscal year totaled $545,998,000, up more than $16,000,000 from the 1957-58 figure. Earnings of $16,817,000 also represents a new high, being $2,123,000 above the previous fiscal year's earnings. Net earnings for the 1958-59 fiscal year amounted to $6.77 per share of common stock, compared with $5.94 in the previous fiscal year reported.

Sales and Earnings Up

National Starch and Chemical Corp., New York, N. Y., has reported increases in sales and earnings for both the second quarter ended June 30 and the six month period ended June 30. Net sales for the second quarter were $13,559,966, compared to $11,652,392 for the same period in 1958. Net earnings after taxes for the quarter amounted to $858,449, or 43¢ per share of common stock, compared with earnings of $767,675, or 39¢ per share for the like period of 1958. Net sales for the six month period totaled $25,934,001, compared with $22,194,635 for the 1958 six month period. National Starch and Chemical's net earnings after taxes amounted to $1,550,764, equal to 78¢ per share of common stock, compared with $1,350,723, or 68¢ per share for the six month period of 1958.

Packaging Forum

The Packaging Institute, New York, N.Y., has announced that 12 seminars head the list of features for the 21st Annual National Packaging Forum which will be held November 16-18 at the Statler-Hilton Hotel in New York City. Other major events include an opening day program by Roy King, vice-president of *Food Field Reporter* and editor of *Food Topics;* awarding of the Packaging Institute's annual citation to the company and the individual who have made the most significant achievements to packaging technology during the past year; the annual business meeting and election of officers of the Packaging Institute; and speakers for the daily luncheon programs and awards dinner.

The seminars will cover such subjects as: Package Marketing; Research and Development; Safety of Packaging Materials; Drug and Pharmaceutical Packaging; Production Line and Machinery; Package Printing; Industrial Packaging; Food Packaging; and Closures.

Record Sales, Earnings

Reichhold Chemicals, Inc., White Plains, N. Y., reports that first half earnings in 1959 were 32 per cent above the same period last year, and sales showed an increase of 37 per cent. Net earnings for the six month period ended June 30 amounted to $1,754,000, including $558,000 profit from sales of investments, equal to 55¢ per share of common stock, compared to earnings of $1,325,000, equal to 44¢ per share for the like period of 1958. Sales for the first half period totaled $47,412,000, compared with $34,511,000 for the 1958 period.

Earnings Up 27.7%

Morningstar-Paisley, Inc., New York, N.Y., reports its earnings for the six month period ended June 30 increased 27.7 per cent over the earnings of the same 1958 period, while sales over the same period increased 19 per cent. Net earnings for the six month period amounted to $320,509, or 65¢ per share of common stock, compared with $250,911, or 51¢ per share for the same period in 1958. Morningstar-Paisley's consolidated sales for the 1959 six month period totalled $12,800,900, compared with $10,737,936 in the same period last year.

Diamond Names Two

Plastics Division of the Diamond Alkali Co., Cleveland, Ohio, has named Phillip I. Johnson as product manager for suspension resins. Peter W. Rizzo will succeed Mr. Johnson as sales representative in the New York-Wilmington area. Mr. Johnson assumes responsibility for market planning, sales promotion and advertising of suspension resins. He is a graduate of the University of Wisconsin, where he earned his B.S. degree in chemical engineering. He joined the Diamond organization in 1958 as a sales promotion representative. Mr. Johnson is a member of the American Chemical Society, and the Society of Plastics Engineers.

Mr. Rizzo holds an M.S. degree in organic chemistry from the University of Chicago, and a B.S. degree in chemistry from Harvard University. Before joining Diamond, he was a sales development representative for various polyvinyl chloride stabilizers for National Lead Co. He is a member of the American Chemical Society and the Society of American Military Engineers.

To Build Polymer Unit

American Chemical Corp., Los Angeles, Calif., has announced plans for the construction of a vinyl chloride polymer unit at Watson, Calif. According to the company, this is the last of four completely integrated units initially planned for its $7.5 million Southern California facility. Construction of the unit is expected to begin in September, with completion planned for mid-1960. The other three units have been under construction since May, 1959. American Chemical reports that the units will manufacture ethyl chloride, ethylene dichloride, vinyl chloride monomer and PVC resins to meet requirements of Western plastics processors and chemical manufacturers. It was also announced that Richfield Oil Corp. and Stauffer Chemical Co., parent companies of American Chemical, will provide the basic raw materials for American Chemical's petrochemical operation.

New Armour Plant

Armour & Co., Chicago, Ill., has announced plans to construct a $250,000 plant in the Philadelphia, Penna. area. According to Armour, the plant will blend and package chemical resins and adhesives.

Roy C. Charron

Joins Stein, Hall

Roy C. Charron (Col., U. S. Army, Ret.) has joined Stein, Hall & Co., Inc., New York, N. Y. as adhesive specialist in the Technical Division. Col. Charron was formerly director of the United States Envelope Co. laboratory at Metuchen, N. J. He served as a lieutenant in World War I and as a colonel on General Hershey's staff and as Deputy Theatre chemical officer E. T. O. in World War II. His educational background includes a degree from the Massachusetts College of Pharmacy and special work at Massachusetts Institute of Technology and Worcester Polytechnic Institute. He is a member of many professional, civic and veterans organizations.

New Resin Facilities

Mobay Chemical Co., Pittsburgh, Penna., has announced that construction of new facilities for the manufacture of polycarbonate plastic resins is underway at Mobay's present plant location in New Martinsville, West Va. Mobay reports that the new plant is scheduled to be in production early in 1960, and the company will be the first American firm to manufacture polycarbonate resins in commercial quantities. Much of the technology of polycarbonate manufacture was originally developed in Germany by the Farbenfabriken-Bayer company, which owns Mobay jointly with Monsanto Chemical Co. of St. Louis. The polycarbonate resin, called Merlon, can be fabricated into end-use products by most of the presently known thermoplastic processing methods, including injection molding, extrusion and vacuum forming, the company states.

Names Representatives

Industrial Sales Division of the United Shoe Machinery Corp., Boston, Mass., has appointed John G. Howley and Charles F. Donovan as sales representatives for industrial adhesives. Mr. Howley will handle both the Bostik and Thermogrip lines of industrial adhesives manufactured by the company's subsidiary, the B. B. Chemical Co. His territory will include Pennsylvania and Maryland. A graduate of Boston College, Mr. Howley has also done post graduate work at the University of Detroit. He was formerly associated with the Minnesota Mining Co. Mr. Donovan, who will specialize in Bostik adhesives, will cover the New England area and will also handle special assignments. He has served in similar capacities at the Finishes Division of Interchemical Corp. and the Angier Products Co. Both appointments are part of a sales expansion program underway for the company's line of industrial adhesives.

Nominates Officers

The nominating committee of the Rubber & Plastic Adhesive & Sealant Manufacturers Council, Chicago, Ill., has prepared a slate of nominees for office for the year 1960. The slate will be presented for a vote at the annual meeting of the board of directors, which will be held at the Hotel Stuyvesant, Chicago, Ill., on September 24 and 25. The slate of nominees includes B. F. Warmer, *President;* F. M. Jeffe, *Treasurer;* J. L. Been, *First Vice-President;* C. W. Walton, *Second Vice-President;* and J. W. Brush, Jr., *Third Vice-President;* Also named were two members from general membership at large including H. L. Dixon and D. G. Williamson.

United Shoe Names Two

John C. Eldridge has been named manager of sales development for Thermogrip hot melt adhesives and applicators by the United Shoe Machinery Corp., Boston, Mass. William J. Blatchford has been placed in charge of installations and service. Both men have served as application engineers for Thermogrip adhesives for the B. B. Chemical Co., a United Shoe Machinery subsidiary that produces the adhesive. Their headquarters will be located at the company's main offices in Boston.

names in the news

John M. Tarrant has been appointed to the newly created position of Midwest area sales manager for Spencer Kellogg & Sons, Inc.

Frank W. Reinhart, chief of the Plastics Section at the National Bureau of Standards, has been elected a Distinguished Member of the Society of Plastics Engineers.

George Whitbread has been appointed technical director of Resin Formulators, Inc.

Walter T. Parry has joined National Starch & Chemical (Canada) Ltd., as technical sales representative in specialty starches and resins.

William P. Hahn has been named to the newly created post of technical manager of Johns-Manville Fiber Glass, Inc.

Royden C. Rinker has been named director of research and development at Armour Alliance Industries. **William H. Neuss** was named manager of research in the Research and Development Department. **Frank M. Rosenblum** was appointed adhesive group leader; **John P. Richards** becomes adhesive research chemist; and **Earl E. Williams** was named adhesives pilot plant manager.

John Moss, formerly chemical engineer in charge of Polyethylene Bag Department at Dobeckmun Co., appointed technical director of the firm's new polyethylene plant in Findley, Ohio.

David Brodess has been named to the staff of the Chemical Division of General Mills.

William Feick, Jr. has been named vice-president in charge of sales for the Flintkote Division. **James E. McCauley** has been named treasurer and **Gene G. Curry** secretary of the Flintkote Co.

John C. Lukman has been named works manager of the polyvinyl alcohol operation of Borden Chemical Co. at Leominster, Mass.

Alan Baruch has transferred to the paint technical service group at the research laboratory of Archer-Daniels-Midland.

Melvin M. Olson has been named research specialist in the Tape Research Department of Minnesota Mining and Manufacturing Co.

Dr. Bernard Oser has been appointed consultant on coatings for aluminum foil by Aluminum Company of America.

Patrick L. Dineen has been appointed general manager of Chicago Adhesive Products Co.

Maurice D. Cooper has been appointed head of the Chemistry Department at General Motors Research Laboratories.

Morris Shaw has been named general sales manager of Ever Ready Label Corp.

J. D. Tudor has been appointed manager of national accounts for the Flintkote Carton Division of Flintkote Co. **Bert Scandelle** was named division sales manager.

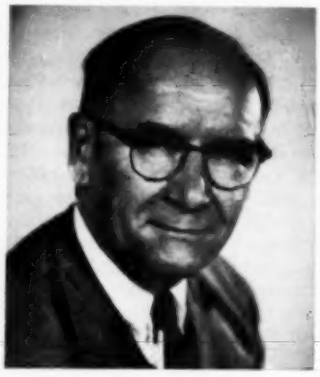
Earl F. Schimkola has been promoted to sales manager of custom polyethylene bags for Dobeckmun Co. **Nason E. Allen,** formerly assistant sales manager, succeeds Mr. Schimkola as manager of Stock Products Division.

William F. Mitchell has been elected a vice-president of General Mills.

Duane N. Sunderman has been appointed chief of the Radioisotopes and Radiation Division of Battelle Memorial Institute.

Carlisle M. Thacker, formerly with DuPont, has joined Taylor Fibre Co. as technical director.

David C. Nelson has been named field sales engineer for scientific instruments for the Scientific and Process Instruments Division of Beckman Instruments.



Fred Wehmer

Portrait of

FRED WEHMER

Recently appointed general manager of General Adhesives Co., Fred Wehmer has been prominent in adhesives and allied fields for more than 25 years. He graduated from the University of Nebraska with a Bachelor of Science degree in chemical engineering, and in 1927 went to work for B. F. Goodrich Co. as a rubber compounder.

In 1932, he accepted an assignment as development engineer for Liquid Carbonic Corp. and did pioneer research on the uses of CO_2 in the manufacture of sponge rubber. He joined the laboratory of Minnesota Mining & Manufacturing Co. in 1936 and worked in their Adhesives & Coatings Division, in Detroit. By 1938, he had been promoted to chief chemist of the laboratory and was eventually made technical director.

Transferred to St. Paul by 3M in 1947, he went to work in the tape laboratories and was assigned to the development of high strength adhesives for use in the aircraft and allied industries. He left 3M in 1953 for a position as technical sales manager of Rubber & Asbestos Corp. In 1954, he returned to 3M as technical service manager of the Adhesives, Coatings & Sealers Division, a post which he retained until accepting his present assignment.

Mr. Wehmer is one of the charter members of the ADHESIVES AGE Editorial Advisory Board.

Firestone Names Hausch

Dr. Walter R. Hausch has been named manager of the Adhesives Development Department for the Xylos Rubber Co., a division of Firestone Tire & Rubber Co. Dr. Hausch will be responsible for the development of new adhesives and the control testing of current production. The company also announced that Don E. Kory has joined the staff of the Adhesives Department.

Dr. Hausch graduated from Akron University in 1940 with a B.S. degree. He earned his masters degree in organic chemistry at the University of Cincinnati and obtained his Ph.D. at Purdue University in 1946. He has been with Firestone since 1947, when he joined the company as a chemist. In 1956, he transferred to Xylos, where he has worked on the development of various types of Loxite, the trade name under which most of the company's adhesives are marketed.

Mr. Kory attended Texas A&M and the University of Michigan, and received a masters degree in protective coatings from the University of Michigan in 1951.

Water Soluble Chemical

Hercules Powder Co., Wilmington, Del., has announced the development of Natrosol 250, a water soluble stabilizer and thickener. The company reports that extensive development work suggests its application in water based emulsion paints, preparation of polyvinyl acetate emulsions, textile warp and finish sizes, paper coatings and paper sizings, ceramics, inks, and latex emulsions for adhesives and coatings. Natrosol is a nonionic water soluble hydroxyethyl ether of cellulose, available in four viscosity types, the company states.

Named Representative

Lee Weil, a specialist in the distribution of architectural and industrial finishes, has been named representative for the Schwartz Chemical Co., Inc., Long Island City, N. Y. Mr. Weil majored in chemical engineering at New York University after service in World War I. He has also received several credits in plastics and industrial engineering from Pratt Institute. In 1926, Mr. Weil reestablished the L. A. Weil Co. Company operations include service to the Metropolitan New York area and Puerto Rico.

Armour Appoints Rich

Armour Alliance Industries, Alliance, Ohio, has appointed William K. Rich to the new position of general sales manager of its Adhesive Division. He will be responsible for all the sales activities for the division. Prior to this appointment, Mr. Rich was regional manager for the Adhesive Division. He has been associated with Armour and Co. since 1930.

The company also has announced the appointment of four new employees to its Research and Development Department. This department serves the Adhesive, Coated Abrasives and Cushioning Products Divisions of Armour and Co. The new appointees are: Frank M. Rosenblum, adhesive group leader; John P. Richards, adhesive research chemist; Earl E. Williams, adhesive pilot plant manager; and Jack L. Martin, laboratory technician.

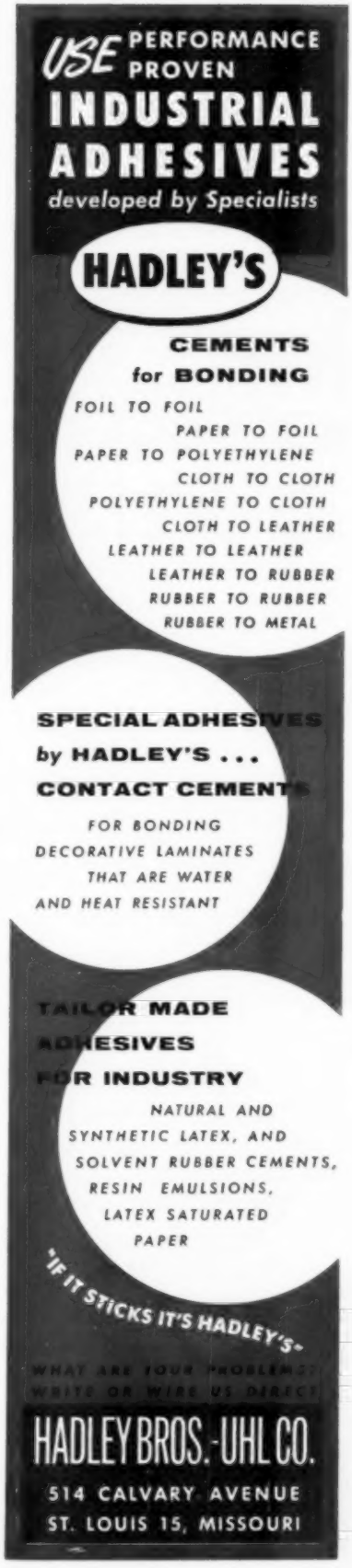
Staley Acquires UBS

A. E. Staley Manufacturing Co., Decatur, Ill., has acquired the UBS Chemical Corp., Cambridge Mass., and has also assumed all the obligations of that company. The acquisition had been under negotiation for several weeks and transfers were made by company representatives in accordance with a prior agreement. Staley delivered to UBS 102,376 shares of common stock to be distributed to UBS stockholders on the basis of one share of Staley common for each 1¾ shares of UBS common stock.

The Decatur corn and soybean processor is acquiring UBS to aid its research and polymer chemical development and to diversify its product lines. Plans are for UBS to operate as an autonomous unit of Staley.

Borden Appoints Chaput

Borden Chemical Co. (Canada) Ltd., West Hill, Ontario, Canada, has appointed Armand Chaput as a sales representative. According to the company, Mr. Chaput will make his headquarters in Montreal and will be responsible for the sale of Borden's full line of industrial adhesives, coatings, building materials, resins, and chemicals in eastern Ontario and Quebec markets. Mr. Chaput, a graduate in business administration from Sir George Williams College, Montreal, previously was with the Plastics and Resins Division of Monsanto Canada Ltd.



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Armour Mergers

The Chemical Division of Armour Chemical Industries Ltd., has merged with Hess Products Ltd. of London, England. The new company will be known as Armour Hess Chemicals Ltd., with half the share capital controlled by Armour and the other half by United Kingdom interests including a substantial proportion by Associated Chemical Companies Ltd. Hess Products was formed in 1946 and acquired patent rights for the fractional distillation of fatty acids from Armour.

Since 1956, Hess has also manufactured the bulk of industrial chemicals sold by Armour Chemical Industries Ltd., London. These chemicals are mainly cationic nitrogen derivatives of fatty acids and are used in the petroleum, road construction, paint, plastic, textile, rubber, flotation and many other industries. A. Henderson has been named chairman of the board of Armour Hess and A. Hess has been named managing director.

Lamination Process

Lawrence Adhesive and Chemical Co., Boston, Mass., has announced that the world's largest flow meter incorporates in its housing the company's multiple lamination process. According to Lawrence, the lamination of the layers of transformer irons that form the core, and cementing of this core to the housing, accomplished through use of Epolac No. 280, makes core and housing a single, integral unit. The huge flow meter, 72 inches in diameter and 16 feet long, was manufactured by the Foxboro Co., Foxboro, Mass., for installation at the new Pittsburgh, Penna., sewage plant.

Lawrence claims that Epolac No. 280 and its lamination process render the enormous flow meter impervious to external climatic conditions, and eliminate seepage and condensation problems.

Sales Conference Held

Morehouse-Cowles, Inc., Los Angeles, Calif., recently held a sales conference at its Cowles Dissolver Co. plant in Cayuga, N.Y., at which 56 sales representatives and executives from the United States, Canada and Europe attended. Featured at the meeting were previews of new models of Cowles dissolvers and Morehouse mills which, according to the company, will soon be publicly announced.

William P. Utermohlen

Technical Director

F. G. Findley Co., Milwaukee, Wisc., has announced the appointment of Dr. William P. Utermohlen, Jr., as technical director. Dr. Utermohlen received his A.B. degree in chemistry from the University of Kansas and his Ph.D. in organic chemistry from the University of Nebraska.

He has worked as assistant director of research for the Toni Division of the Gillette Co.; chief research chemist for Pfaudler-Permutit Co.; and research chemist for Tennessee-Eastman Corp. Prior to joining Findley, he was director of research for Velsicol Chemical Corp. Dr. Utermohlen has authored many papers and holds a number of patents in the area of organic synthesis.

The F. G. Findley Co. manufactures a full line of adhesives for the packaging, paper convertings and industrial fields.

Plastic Exhibit

Resin Research Laboratories, Inc., Newark, N. J., is sponsoring this Fall a Plastic World of Tomorrow exhibit featuring models of future homes, clothes, cars, machinery, boats, etc., all from the world of plastics.

The U. S. Army, Navy and Air Force, DuPont, Walt Disney, Esso, and Carborundum Corp. are among those who have been selected to contribute to the exhibit which will be seen at schools, shopping centers, railway terminals and on television throughout the country. After display in the United States, the exhibit will be shipped to Moscow for a tour of the U.S.S.R. as part of international cultural exchange.

Vacuum Coaters Meeting

The Third Annual Meeting of the Society of Vacuum Coaters will be held on January 26 and 27, 1960, at the Hotel Biltmore in New York City. A business meeting will be held in the afternoon on Tuesday, January 26, and technical sessions will be held on Wednesday, January 27. A tentative program has been scheduled for the technical sessions.

After the opening address, the following papers will be presented at the first session: "Automation in Lens Coating", by Eastman Kodak Co.; "Thick Films", by NRC Equipment Corp.; "Equipment Design for Maintaining Dust Free Conditions", by American Air Filter Co.; "Lacquer Automation and Vacuum Metallizing", by Jema-American, Inc.; "Filaments, Firing Techniques and Some Causes of Discoloration of Metalized Coatings", by Luster-Coate Metallizing Corp.; and "A Commercial Cold Mirror", by Bausch & Lomb Optical Co.

Papers to be presented during the afternoon session will be: "Safety Factors for Handling Flammable Materials", by Red Spot Paint & Varnish Co.; "Principles of Electrostatic Spraying of Metallizing Coatings", by Bee Chemical Co.; "Design and Plan to Metalize", by C. Felsenthal & Sons; and "Vacuum Deposited Protective Films", by Vacuum Equipment Division of the New York Air Brake Co. After presentation of the papers, a New Equipment Symposium will be held.

New Division Name

Lord Manufacturing Co., Erie, Penna., has announced that Hughson Chemical Co., a division of Lord Manufacturing Co., is the new name of the former Special Products Division of the company. According to Lord, the change was made to reflect the broader scope and newer interests of the growing division. Its principal activity has been the development and manufacturing of special purpose adhesives marketed under the trade name of Chemlock. These adhesives are now widely used in the rubber industry for rubber-to-metal bonding and specialized applications, the company states. Lord reports that the products of Hughson will be diversified to include metal surface treatments, protective coatings, and other chemical specialties.

Borden Plans Expansion

Borden Chemical Co., New York, N.Y., has announced plans for the construction of Colombia's first formaldeyhde plant, the recent expansion of an Argentina casein plant, and the beginning of polyester resin production in Brazil as the first steps in its five-year program of planned growth in South America. The company reports that it plans to build a 7 million pound per year capacity formaldehyde plant in Cali, Colombia. The plant will also be equipped to manufacture synthetic resins for the plywood, furniture, foundry and textile industries.

In Buenos Aires, Argentina, where Borden recently reactivated its casein operation, production is expected to be tripled with the acquisition of new quarters. In addition to casein, the Argentina operation is also producing a line of protein glues. The firm has recently put on stream a $4.5 million methanol plant near Sao Paulo, Brazil, and has begun polyester resin production on a 60 acre plot near Sao Paulo. The methanol plant uses Bunker C fuel oil as a raw material and produces formaldehyde for resins and adhesives from the methanol.

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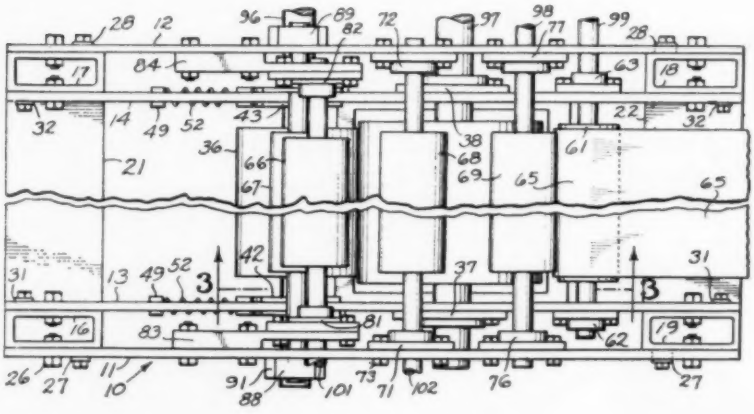
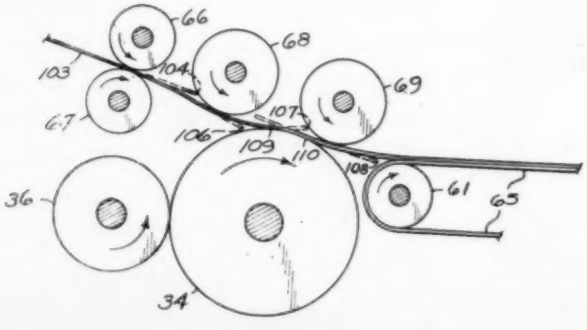
Glue Spreader

U. S. Patent 2,879,741, issued March 31, 1959 to George D. Mohr, assigned to Clear Fir Products Co., Inc., describes a glue spreader for use in conjunction with flexible sheet material, such as flexible wood, veneers, and other wood products.

The apparatus is shown in the accompanying schematic diagrams. Sheet material (103) passing through the apparatus enters the apparatus through pinch rolls (66 and 67) which are spaced from a hold-down roll (68) and angularly placed with respect to each other so that the leading edge of any sheet passing through the apparatus strikes the hold-down roll (68) at a point (104). The hold-down roll (68) is positioned over an applier roll (34) so that the leading edge of the sheet (103) strikes the applier roll at a point (106), and then is deflected over the upper surface of the applier roll. The second hold-down roll is positioned beside the applier roll so that upon leaving the applier roll the leading edge of the sheet strikes a hold-down roll (69) at a point (107), and then is deflected downwardly toward an outfeed roll (61) striking a belt (65) mounted on the roll at a point (108). The material is then deflected by the outfeed roll (61) and belt (65) and passed out of the apparatus.

When a sheet of material is passing continuously through the apparatus, the material will be deformed generally as indicated by the solid lines in the lower schematic. By mounting the hold-down rolls so that a common tangential plane of the rolls intercepts the periphery of the applier roll, and by providing infeed and outfeed means for deflecting sheet material against the hold-down rolls, intimate contact of the sheet with the applier roll is provided, as at points 109 and 110.





Pressure-Sensitive Tape

U. S. Patent 2,882,183, issued April 14, 1959 to Herbert M. Bond and Gaylord L. Groff, assigned to Minnesota Mining & Mfg. Co., discloses a storable heat-resistant pressure-sensitive adhesive tape product having a silicone backing and a silicone adhesive.

The structure requires no interliner but is wound in roll form with the adhesive surface in direct contact with the outer back surface of the backing. The tape product has good storage life in roll form, and may be unwound from the roll without splitting or offsetting of the adhesive.

These results are accomplished by applying to the back surface of the silicone backing a firmly adherent low-adhesion backsize barrier coating which itself consists largely of silicone resin, and then heat-curing the latter on the surface of the backing.

Low-Adhesion Backsize

U. S. Patent 2,876,894, issued March 10, 1959 to Carl A. Dahlquist, Arthur H. Ahlbrecht, and George M. Dixon, assigned to Minnesota Mining and Manufacturing Co., discloses a novel and effective low-adhesion backsize coating for normally tacky or pressure-sensitive adhesive tapes. This coating permits the tape to be unwound from the roll with considerably less force.

Extremely thin low-adhesion coatings can be formed by coating and drying a solution of a solid copolymer of a vinyl monomer (e.g., vinyl stearate) and a maleic monomer (e.g., maleic anhydride).

Bisulfite Products

U. S. Patent 2,880,236, issued March 31, 1959 to Charles L. Mehltretter, John W. Van Cleve, and Paul R. Watson, assigned to Secretary of Agriculture, discloses a method of producing bisulfite addition products of dialdehyde starch, which possess a substantial degree of water solubility, and which may be used as adhesives and for other purposes.

The method involves intimately contacting dialdehyde starch with an aqueous solution of sulfurous acid or a water-soluble bisulfite.

Phenol-Aldehyde Adhesive

U. S. Patent 2,878,197, issued March 17, 1959 to Gene F. Baxter, Peter K. Schoening, and Henry M. Preusser, assigned to American-Marietta Co., relates to the production of thixotropic phenol-aldehyde adhesive composition useful in the manufacture of plywood.

An aqueous alkaline solution of a thermosetting phenol-aldehyde resin condensation product is first prepared. A first portion of this resin solution is mixed with a dilute sodium hydroxide solution and ground ligno-cellulose residue extender produced as a by-product from the manufacture of furfural. The sodium hydroxide swells the extender, to confer viscosity stability on the adhesive composition.

The resulting mass is mixed with a second portion of the original resin solution, whereupon the swelling of the extender terminates. The resulting mass is also thinned by the solution thus added. Thereafter, the thinned mass is mixed with a filler which has thickening and bulking properties.

A third portion of the original resin solution is then added, to increase the resin solids content.

Foundry Core Binder

U. S. Patent 2,875,073, issued February 24, 1959 to Charles J. Gogek, and assigned to Corn Products Refining Co., discloses a foundry core binder.

The core mixture consists of 100 parts of sand, 0.25 to 2 parts of cereal binder, 0.5 to 5 parts of sugar, 0.002 to 0.15 parts of an adjunct, per part of sugar, and enough water to null the resultant mixture.

The adjunct may consist of hydrochloric acid, sodium chloride, a mixture of paraformaldehyde and ammonium chloride, boric acid, sulfuric acid, or phosphoric acid.

Starch Matrix

U. S. Patent 2,876,160, issued March 3, 1959 to Thomas J. Schoch and Charles C. Spencer, assigned to Corn Products Refining Co., describes a process of imbedding a water insoluble material in a protective starch matrix in dry, free-flowing form to protect said material against chemical and physical changes.

The material is dispersed in a complete solution of chemically-modified solution. The dispersion is then dried and subdivided.

Urea-Formaldehyde Adhesive

U. S. Patent 2,879,236, issued March 24, 1959 to Albert P. Yundt and Keith E. Bradway, assigned to Union Bag-Camp Paper Corp., describes a method of preparing a starch and urea-formaldehyde size or adhesive which is free from tendencies toward retrogradation, and which is only slowly subject to gelation and increase of viscosity on aging.

Formaldehyde and urea are directly added to the starch solution under mild acidic conditions, with the formaldehyde greatly in excess of the urea in molal ratio. After the starch-formaldehyde-urea mixture is cooked, sufficient urea is added to bring the formaldehyde to urea molal ratio to about 2.0. When cooled, a relatively stable, fluid starch solution is obtained, which can be cured to an unsoluble starch film. If long pot life is desired, the solution can be neutralized or made slightly alkaline.

Stabilized Rosin Size

U. S. Patent 2,881,084, issued April 7, 1959 to Spencer H. Watkins and assigned to Hercules Powder Co., describes a method of stabilizing tall oil rosin sizes against crystallization.

It has been discovered that crystallization is strikingly inhibited in paste tall oil rosin sizes by the inclusion of 5 to 20% by weight, based on the weight of the rosin, of a rosin acid ester of ethylene glycol, pentaerythritol, or sorbitol. Tall oil rosin sizes so treated are resistant to crystallization over relatively long periods of time even when seeded with rosin salt crystals.

Starch Modifiers

U. S. Patent 2,880,107, issued March 31, 1959 to Hillary Robinette, Jr., relates to the use of N-N dihalohydantoins as modifiers of starch to affect its viscosity.

The modified starches are prepared by cooking in an aqueous medium in the presence of the hydantoin. The latter cause no degradation of the starch and no conversion into dextrins or sugars. It breaks the large micelles of the swollen starch granules into smaller micelles which are then more easily dispersed in water.

The better films thus obtained are particularly useful in paper coating compositions, and the improved penetration also obtained is important in textile yarn sizing operations.

Other Patents of Interest

Subject	Inventor or Assignee	Patent No.	Date
Handling thermo-responsive cements	B. B. Chemical Co.	2,874,084	2/17/59
Film mount adhesive liquid applicator	Eastman Kodak Co.	2,874,673	2/24/59
Apparatus for coating wallboard tape with adhesive	Forrest M. Moore	2,876,730	3/10/59
Adhesive tape with convolutions tensioned under predetermined program	Johnson & Johnson	2,876,893	3/10/59
Adhesive coated plastic material	Johnson & Johnson	2,877,141	3/10/59
Tape coating and dispensing apparatus	United Shoe Machinery Corp.	2,878,777	3/24/59
Hydraulic cement	Socony Mobil Oil Co., Inc.	2,878,875	3/24/59
Adhesive compositions of polyepoxide resins and butadiene-acrylonitrile rubbers	Rubber and Asbestos Corp.	2,879,252	3/24/59

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.

new equipment

Adhesive Applicator

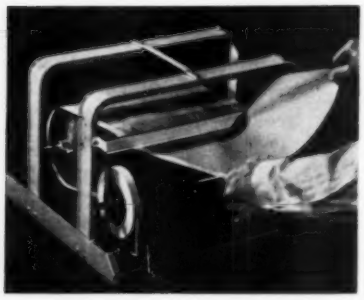
A new pressure fed applicator feeds solvent adhesives through a hose to a brush where the operator has fingertip control over flow and shut-off. The Bostik adhesive applicator is designed for production work where solvent rubber adhesives are now being hand brushed. Substantially increased production rates, uniform adhesive viscosity, cleaner work, and elimination of waste and the hazard of open containers are advantages claimed for the equipment by its maker. The portable tank operates on 20 pounds factory air pressure, and output pressure can be regulated to provide optimum adhesive flow for thick or thin viscosity. Each unit has multiple fittings to permit three operators to work from one tank. Various sizes of the lightweight aluminum brushes can be interchanged for use with the applicator. *Bostik Department, B. B. Chemical Co.* **E-110**

Flow Control Register

A counting device, called the Flow Control Register, is designed to count cartons, cases and boxes as they pass along a conveyor system. A combination of mechanics and electrical circuitry is designed to make accurate counts possible without the need to space individual objects on the line. The counting is accomplished as each item passes over a roller, depressing trigger fingers which open a circuit to generate an electrical impulse. Various accessories provide flexibility in automatic counting, stopping and starting. *Rapids-Standard Co., Inc.* **E-111**

Apron Tapers

Two new apron tapers and a new line of masking paper have been introduced to satisfy the needs of industrial trades. The apron tapers—in two widths, 15 and 36 inches—will accommodate a single roll or a combination of masking paper widths up to those limits, such as 6 and 9-inch rolls on the 15-inch machine, or 12 and 24-inch rolls on the 36-inch machine. The tapers are easily converted to double-edge taping. The masking paper was formulated to meet the requirements of industry, and comes in standard widths of 3, 6, 9, 12, 18, 24 and 36 inches. *Minnesota Mining & Manufacturing Co.* **E-112**



Hotplate Shaker

A new rotating tilting hotplate-shaker, called Roto-Tilt, is designed for rapid evaporation of liquids, speedy dissolving of solids, or general purpose shaking. The instrument imparts a swirling motion to liquids similar to that produced manually; it holds various size and shape containers. The amount of heat and speed of agitation are controllable. The machine can be used as a shaker only without the hotplate. *Eberbach Corp.* **E-113**

Gummed Tape Machine

A table model electric gummed tape machine, tradenamed Better Pack 555, is designed to measure, "thermo-moisten," cut and deliver tape in a fraction of a second. The machine provides selector keys, which by a touch of the finger, deliver the required length of tape, ready for application. The scale ranges from 6 to 36 inches to from 15 to 45 inches. A release key provides smaller or greater lengths as needed. A built-in heater keeps the water thermostatically controlled at the temperature needed for quick, thorough glue activation. A double brush unit with adjustable pressure control offsets differences in tape widths, weights, glues, room temperatures and hardness of water. *Better Packages, Inc.* **E-114**

Gelation Timer

An instrument designated the Tecam Gelation Timer is used to automatically gel resins and other liquids. The unit can be left working overnight or on weekends, and when gelation time is reached, the synchronous motor stops automatically and the time in minutes can be read on a counter. A weighted disc immersed in the liquid is subjected to a simple harmonic vertical motion; with a periodic time of one minute. As the liquid sets, a point is reached at which stiffness is sufficient to support the weight of the disc during a 30-second half-cycle. When this happens a relay irreversibly stops the motor and lights a small neon lamp to attract attention. Gelation time is read off in minutes on the counter. The cabinet of the apparatus measures 2½ x 4 x 5 inches; total weight of the instrument is 2½ pounds. *Arthur S. LaPine and Co.* **E-115**

Planetary Mixer

A new planetary mixing and kneading machine processes a wide range of materials highly fluid, viscous or pasty in consistency. An unusually efficient planetary action is claimed by the manufacturer. Two

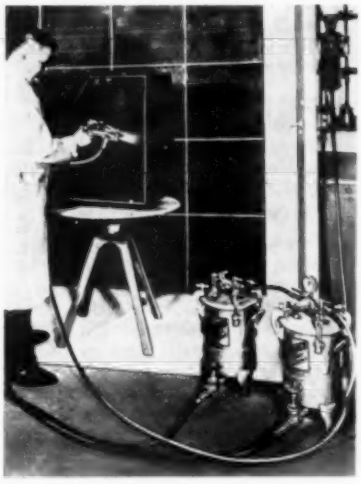
mixing spindles equipped with helically arranged vanes move along the tank wall while rotating at high speed around their own axes. The mixing mechanism is raised and lowered automatically. The machine has a new kind of tank speed arresting mechanism. Swivel, tilting, runout or stationary tanks are provided in capacities from 1 to 350 gallons. The use of several tanks permits almost continuous production. The mixer is available in several types and power specifications. If heating or cooling are required in the mixing process, double wall tanks can be furnished. *J. M. Lehmann Co.* **E-116**

Automatic Metering Pump

An automatic metering pump, called the Microflo Auto-Pneumatic Pulsafeeder, is a controlled volume pump that meters fluids at "micro" flow rates in response to automatic signals from pneumatic control instruments. Operating pressures up to 2000 psig are acceptable. Because the unit is a diaphragm pump, no stuffing box or other sealing mechanism is needed. The liquid handled is completely separate from the pump mechanism and therefore possibility of product contamination or leakage to atmosphere is said to be eliminated. Automatic control mechanism permits metering in accordance with such changing process conditions as variable flow rates, temperature change, fluctuating pressure or degree of acidity or alkalinity. Two models are available, one having maximum theoretical capacity of 2300 ml./hr. at pressure up to 1000 psig; and the other a capacity of 1040 ml./hr. at pressure up to 2000 psig. *Process Equipment Division, Lapp Insulator Co.* **E-117**

Two-Headed Spray Gun

A two-headed spray gun can be used for almost any two-component finishing system where perfect mixing is not required, or where pre-mixing is impossible or impractical. Designated Model 181, the gun is available with air and material nozzle sizes to



suit individual requirements. Some applications may necessitate the use of two different size nozzles, depending on the viscosity of the material being sprayed and the ratio of material quantity. The gun body is of drop forged aluminum. Gun heads are of drop forged bronze, but are also available in stainless steel. The needle stroke is controlled at the gun handle, as with standard guns, and spray patterns of each gun may be regulated from round to fan, with any intermediate configuration. Three hoses, two for material and one for air, are used with the gun. Ordinarily two pressure tanks supply equal pressure to each head, but different pressures can be used. *Binks Manufacturing Co.* **E-118**

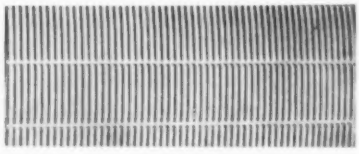
Continuous Mixer

A new small model continuous automatic mixer, designated Model 4M, has been designed to fit the re-

quirements of the laboratory for research, experimental work and for small pilot plant use. The mixer is available as an integral unit with direct connected variable speed drive, or as a separate unit for belt drive. *E. T. Oakes Corp.* **E-119**

Glue Roll Grooving

A composite grooving on glue spreader rolls, featuring both helical and lengthwise grooves, is said to apply an even and economical glue line to one or two sides of a door



frame assembly. This grooving tends to reduce or eliminate the wring-off on the sides and trailing edge of the frame as it passes between the gluing rolls, saving adhesive as well as making a cleaner operation. The accompanying illustration shows the grooving with nine helical grooves to the inch and lengthwise grooves spaced approximately one inch apart. Conventional resilient gluing rolls can be reground and regrooved with this composite grooving. *Black Brothers Co., Inc.* **E-120**

FOR MORE INFORMATION on the new equipment items described here, use the Reader's Service Card elsewhere in this issue.

book reviews

Separation and Purification of Materials. ***By Rolt Hammond. Published by Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y. 5½ x 8¾ in. 328 pp. $10.00.***

Processes for the separation and purification of materials form an important aspect of chemical manufacture, and this book fulfills a real need in describing the major processes employed, their fields of application and their limitations. The author is English, and his experience is based on the industrial operations of Great Britain. Nevertheless, the availability of the volume to the American reader is to be welcomed.

The chapter titles indicate the excellent general survey which the author has made: (1) Separation of Solids, (2) Separation of Solids from Liquids, (3) Separation of Solids from Gases, (4) Distillation, (5) Centrifugal Separation, (6) Separation of Gases, and (7) Separation and Purification in Nuclear Engineering. Literature references follow each chapter, and an extensive subject index closes the book.

The author has written clearly and concisely and with considerable depth. The inclusion of an ample number of schematic diagrams, graphs and tables aids in the presentation of the material. From the multiplicity of plant equipment available for the different functions the writer has described the main types for each so that a suitable choice may be made.

The book is Volume I in a series on "Physical Processes in the Chemical Industry" which is being prepared by the publisher. It is a worthy introduction.

Continuous Analysis of Chemical Process Systems. ***By Sidney Siggia. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 6 x 9¼ in. 382 pp. $8.50.***

A valuable and comprehensive work on the instruments available for continuous analysis of components in chemical process systems is offered in this volume. In recent years chemical analysis has advanced to the stage where many such analyses can be run directly in the plant equipment as a part of the process so that rapid automatic adjustments can be effected as required. Such a survey as that made in this book is of the greatest value to industry, which on the whole is adopting this type of control.

The book begins with an introductory chapter which defines the field of continuous analysis and which illustrates the role it plays in industry and chemical engineering. This is followed by a chapter dealing with the establishment of facilities which includes suggestions on how to proceed, possible pitfalls and the economics involved in introducing such equipment.

The bulk of the book, which follows, deals with the available instruments for each type of analysis. Some of these, for example, are density and specific gravity, viscosity, determination of water and infrared absorption. The usual arrangement of each of the chapters is a general introduction followed by a discussion of each available instrument in the category of analysis being discussed.

The author has done an incredible amount of research in assembling this material. Practicing analysts and engineers and as well as students will find his efforts of value.

Labor-Management Relations. ***By Charles Wiedemann. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 5x7½ in. 142 pp. $3.75.***

This book deals with the problems involved in employee-employer relations, offering methods of solution for these problems and new techniques for management administration and policy in both union and non-union operations. The principles outlined apply to blue collar, white collar and professional employees.

Various chapters present information on management, labor, jurisprudence, the union contract, union security, "right to work" laws, management rights, wage incentives, seniority, the strike threat, grievance procedure, arbritration and administering the union contract.

The writer has assumed a Gargantuan task for himself when he attempts to sum up the field of labor-management relations in a small volume, and in addition give advice on what to do in particular situations. He has, however, done a commendable job within the scope of his small format, and has produced a practical readable guide for participants in the field. What he has to say on each of the numerous subjects is by no means exhaustive, but nevertheless well worth perusal. Included are model contract clauses covering subject matters that are the most worrisome and complex for negotiators and the full text of laws governing labor relations. These represent only a portion of the valuable information given.

Trade Literature

Thread and Gasket Sealant. Data on a high-grade thread and gasket sealant for production line assembly and general maintenance are given in a small six-page folder. Discussed are unformity of composition; plasticity; texture; reresistance to pressure, steam and vibration; solubility; prevention of friction; anti-corrosion properties, and performance characteristics. Recommended uses include application as a pipe joint sealant, packing lubricant, preventitive of thread corrosion and as a gasket. A unique feature of the folder is a Fahrenheit temperature guide which shows how the material may be applied at various temperatures from —50 to +2948°. *James K. Harbinson & Co., Inc.* L-119

Rubber Sealant. An eight-page bulletin gives information on a synthetic rubber compound, tradenamed Del, used as a sealant material. Typical uses in construction are detailed, and buildings where the product has been used are illustrated. Extensive information on how to use and how to apply the compound is given. Schematics of typical window details and typical joints where the sealant finds application are shown. The last page of the bulletin is devoted to two additional products, a permanently plastic sealing compound supplied in tape form, and a permanently plastic sealing compound which features a polybutene resin vehicle with asbestos fiber filler. *David E. Long Corp.* L-120

Adhesion-Resistant Coatings. Syl-Off silicone coatings, described in a new 4-page technical bulletin, are said to impart excellent release or anti-adhesive characteristics to paper, paperboard and other surfaces. Tht bulletin lists advantages (non-contamination, nonmigration, non-alteration of stocks, permanency and water repellency) and gives other information on use of the coatings. Considerable attention is given to numerous end-uses where the coatings have been used to advantage. *Dow Corning Corp.* L-121

Adhesive Tester. A testing instrument which measures the strength of adhesive bond by its resistance to shearing or peeling forces is described in a two-page technical bulletin. The T-A-C tester, as it is called, was designed to give a test which simulates the factors involved in the actual use of adhesives and adherends in production operations such as high speed packaging, labelling and laminating. The bulletin provides complete data on the principle and operation of the machine. *Thwing-Albert Instrument Co.* L-122

Trade Literature (Cont'd.)

Octylene Oxide. A low viscosity chemical which reduces the viscosity of conventional epoxy resins based on bisphenol A is described in a 6-page, unbound technical information sheet. Advantages of the lower viscosity resin system include improved workability, better filling of voids in intricate castings, higher solid loadings, better wetting, better impregnation, lower exotherm and increased pot life. Extensive technical data are presented. A coating formulation with an amine cure and end properties of the product are included. *Chemicals & Plastics Division, Food Machinery and Chemical Corp.* L-123

Spray-on Coatings. The applications and economics of spray-on, strip-off coatings are described in a small eight-page bulletin. The advantages of strippable coatings in protecting finishes of metals, plastics, glass, rubber, ceramics, and painted or enamelled surfaces against weathering and abrasion are stressed. The strippable film also doubles as a frisket to mask irregular surfaces for painting and decoration, and to permit economical mass-production automatic spray-masking. *Spraylat Corp.* L-124

Rubber Adhesives. A 32-page booklet on Hycar polyacrylic rubber contains a four-page section on adhesives and coatings. Discussed are bonding of the rubber to metals, fiber glass cloth, cotton, and nylon. Bonding can be accomplished by vulcanization and by use of cements. Extensive data on the recipes of the rubber compounds and physical properties of the vulcanizates and of the bond strengths as related to the coating of metal are presented in graph form. *B. F. Goodrich Chemical Co.* L-125

Sealing Shipments. A 24-page booklet presents information on how to mark and seal containers for shipment. The efficient ways of stencilling packages is dealt with at length, and considerable information is presented on electric tape machines for sealing like and unlike packages. Also included are conversion tables for weights and measures; export marking data, and a scale for measuring in inches and centimeters. *Marsh Stencil Machine Co.* L-126

FOR MORE INFORMATION on the trade literature reviewed here, use the Reader's Service Card elsewhere in this issue.

Glue Spreaders. A 12-page bulletin describes a line of resilient roll glue spreaders for resins, caseins, polyvinyls and similar adhesives. The line features a total of 39 sizes in four models with 8 through 122-inch capacities in 6-inch increments. Construction features and optional features are analyzed in text and illustrated with photographs and schematic diagrams. One page of the brochure is devoted to a bench model glue spreader for laboratory and light production work. *Black Brothers Co., Inc.* L-127

Liquid Plastics. A line of liquid polyvinyl plastics which set with heat is described in a new 16-page booklet. Known as Logosol, the line is presented with detailed information on its application and use. The materials may be utilized by hot or cold dipping; hollow or solid casting; and knife, roller or spray coating. *Bee Chemical Co.* L-128

ADVERTISERS' INDEX

ADHESIVES AGE—SEPTEMBER, 1959

American Latex Products Corp.	3
Carter Bell Manufacturing Co.	8
Colton Chemical Co.	47
Darling & Co., Glue Div.	5
Dow Corning Corp.	15
Dural Co., Inc.	59
Fox, John P., Co., Inc.	53
Goodrich, B. F. Chemical Co.	45
Goodyear Tire & Rubber Co.	9
Hadley Bros.-Uhl Co.	57
Leffingwell Chemical Co.	58
Minnesota Mining & Manufacturing Co.	19
Morehouse-Cowles, Inc.	11
Mystik Adhesive Products, Inc.	6
Potdevin Machine Co.	54, 59
Roberts Co.	Cover 2
St. Clair Rubber Co.	49
Schaefer Machine Co., Inc.	6
Schenectady Varnish Co., Inc.	51
Semco Sales & Service, Inc.	49
Shawinigan Resins Corp.	Cover 3
Stamford Rubber Supply Co.	6
Stauffer Chemical Co.	4
Thiokol Chemical Corp.	Cover 4
Wallace, L. R., & Co.	53

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in passing

Plastic Bags

An educational program to alert the public to the danger of allowing children to play with discarded plastics film is well under way. The problem is one of the measures decided upon at an industry wide meeting, sponsored by the Society of the Plastics Industry with representation from the National Safety Council, to prevent deaths from suffocation of young children playing with the material.

A pamphlet entitled "Plastic Film—Correct Use and Misuse—With Helpful Hints to Parents" has been prepared by SPI and is being distributed throughout the country by the American Academy of Pediatrics, the American Academy of General Practice, the National Institute of Dry Cleaning, the National Safety Council and the Public Health Service of the Department of Health, Education and Welfare.

This step by the Society is in addition to the educational work being done by independent plastics materials manufacturers and converters to inform the public of the proper use and disposal of thin film coverings. The Plastics Society has also prepared a special placard for dry cleaners to inform parents of the hazards of re-using film garment coverings for improvised covers on cribs, playpens and upholstery.

Job Hunting?

The Employment Service of the State of Alaska has announced that the forty-ninth state's labor force is easily capable of supplying the requirements of most employers. People thinking about going to the Union's northernmost outpost for work ought to make sure the job is there before starting the long trip. The state employment service lists some openings for civil, electrical, and electronics engineers; psychologists and psychiatric social workers; aircraft mechanics; and insurance salesmen. Otherwise, the agency expects no important increases in employment openings.

Wave of the Future

Adhesives will replace nails in holding together the wooden containers of the future if possibilities explored by the U.S. Forest Products Laboratory prove practical. This unit of the Department of Agriculture recently pooled the ideas of 47 experts, including 29 representatives of the adhesives industry, in an effort to solve problems of cost and other inherent difficulties associated with nailed containers. Consensus was that no present adhesive can do the job, but that new adhesive systems and a modification of container joints may provide the answer in the future.

Alcoholism

A book springing from DuPont's success in rehabilitating alcoholics among its employees has been written by Dr. C. A. D'Alonzo, assistant director of the Medical Division, as a guide to the control of alcoholism by individuals and organizations. Titled "The Drinking Problem and Its Control," the book has just been published by the Gulf Publishing Co. of Houston, Texas. DuPont inaugurated an experimental plan of rehabilitating alcoholics 15 years ago as part of its preventive medical program for employees. It succeeded beyond expectations, saving the health, sanity, or even the lives of more than 900 men and women in that time. Its effectiveness has inspired other organizations in the United States and Canada to similar efforts.

Definitions

Those of us who are suburban householders are subject to a variety of perils unknown to apartment dwellers according to a chiropractor who recently addressed fellow members of his craft at a convention in Chicago. His list of ailments runs thusly:

Green Thumb Thigh—A complicated ailment associated with digging and hoeing in the garden.

Wheelbarrow Back—From too much "do-it-yourself" with a wheelbarrow.

Patio Posture—From lifting flagstones for patios and from moving heavy lawn furniture.

Tractor Back—A compression of the spine produced by riding power lawn mowers.

Diving Board Disc—An ailment of aging athletes.

How Much?

How much does the average consumer consume? In his autobiography, the late James R. Adams, cofounder of MacManus, John & Adams, gives some revealing figures: From the time he is 12 until he dies at about 70, the *average* man (not the big spender), buys 300 shirts, 200 suits of clothes, 50,000 meals, 10 to 15 automobiles, 200 pairs of shoes, and 5,000 packages of cigarettes.

Raw Deal

Work uniforms are sometimes the issue in labor disputes but at the Island of the Sun near Rio de Janeiro, the lack of any clothes has created a strike situation. The island is a nudist colony where even hired workers are required to go around in the raw. The workers protested, saying it was too cold during the South American winter to work comfortably nude.